Digital Archaeology at the UWien

01/04/2026 | CAA '26

Geert Verhoeven

universität wien



DEFINITION

DIGITAL ARCHAEOLOGY

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… is that part of archaeology in which digital technology is methodologically indispensable

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… begins where digital technology goes
beyond merely recording or preparing archaeological data

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***structuring* data formally**
***modelling* data explicitly**

DIGITAL ARCHAEOLOGY

… is that part of archaeology in which digital technology is methodologically indispensable

… begins where digital technology goes beyond merely recording or preparing archaeological data

… becomes essential for
***structuring* data formally**
***modelling* data explicitly**
***analysing* data to produce new archaeological information**

THE THRESHOLD

THE THRESHOLD

~~**DIGITAL ARCHAEOLOGY**~~

preparatory

THE THRESHOLD

~~**DIGITAL ARCHAEOLOGY**~~
preparatory

DIGITAL ARCHAEOLOGY
epistemically constitutive

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epistemically constitutive



ACQUISITION

records data

THE THRESHOLD

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DIGITAL ARCHAEOLOGY
epistemically constitutive



ACQUISITION
records data



PRE-PROCESSING
creates conditioned data

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~~**DIGITAL ARCHAEOLOGY**~~
preparatory

ACQUISITION
records data

PRE-PROCESSING
creates conditioned data

DIGITAL ARCHAEOLOGY
epistemically constitutive

STRUCTURING
organises data formally and semantically

THE THRESHOLD

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preparatory

ACQUISITION
records data

PRE-PROCESSING
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DIGITAL ARCHAEOLOGY
epistemically constitutive

STRUCTURING
organises data formally and semantically

MODELLING
formalises entities, relations, processes

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organises data formally and semantically

MODELLING
formalises entities, relations, processes

ANALYSIS
generates archaeological information

THE THRESHOLD

~~DIGITAL ARCHAEOLOGY~~
preparatory

ACQUISITION
records data

PRE-PROCESSING
creates conditioned data

INTERPRETATION
assigns archaeological meaning

DIGITAL ARCHAEOLOGY
epistemically constitutive

STRUCTURING
organises data formally and semantically

MODELLING
formalises entities, relations, processes

ANALYSIS
generates archaeological information



TEACHING

ACQUISITION (NOT DA)

ACQUISITION (NOT DA)

PHOTOGRAPHY

terrestrial – underwater

image-based 3D surface modelling



ACQUISITION (NOT DA)

PHOTOGRAPHY

terrestrial – underwater

image-based 3D surface modelling

INSTRUMENT-BASED SURVEYING

level – total station – GNSS – TLS



ACQUISITION (NOT DA)

PHOTOGRAPHY

terrestrial – underwater

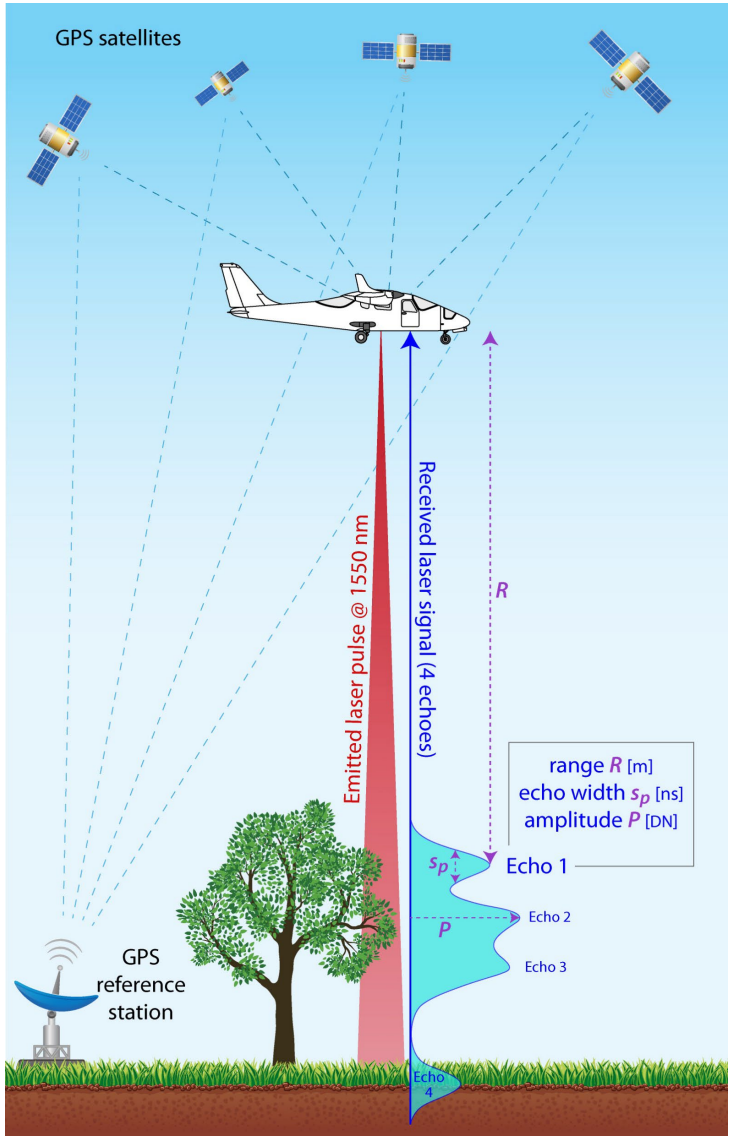
image-based 3D surface modelling

INSTRUMENT-BASED SURVEYING

level – total station – GNSS – TLS

PROSPECTION

aerial photography – ALS



ACQUISITION (NOT DA)

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terrestrial – underwater

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submerged geophysics

sidescan sonar - multibeam sonar - sediment sonar



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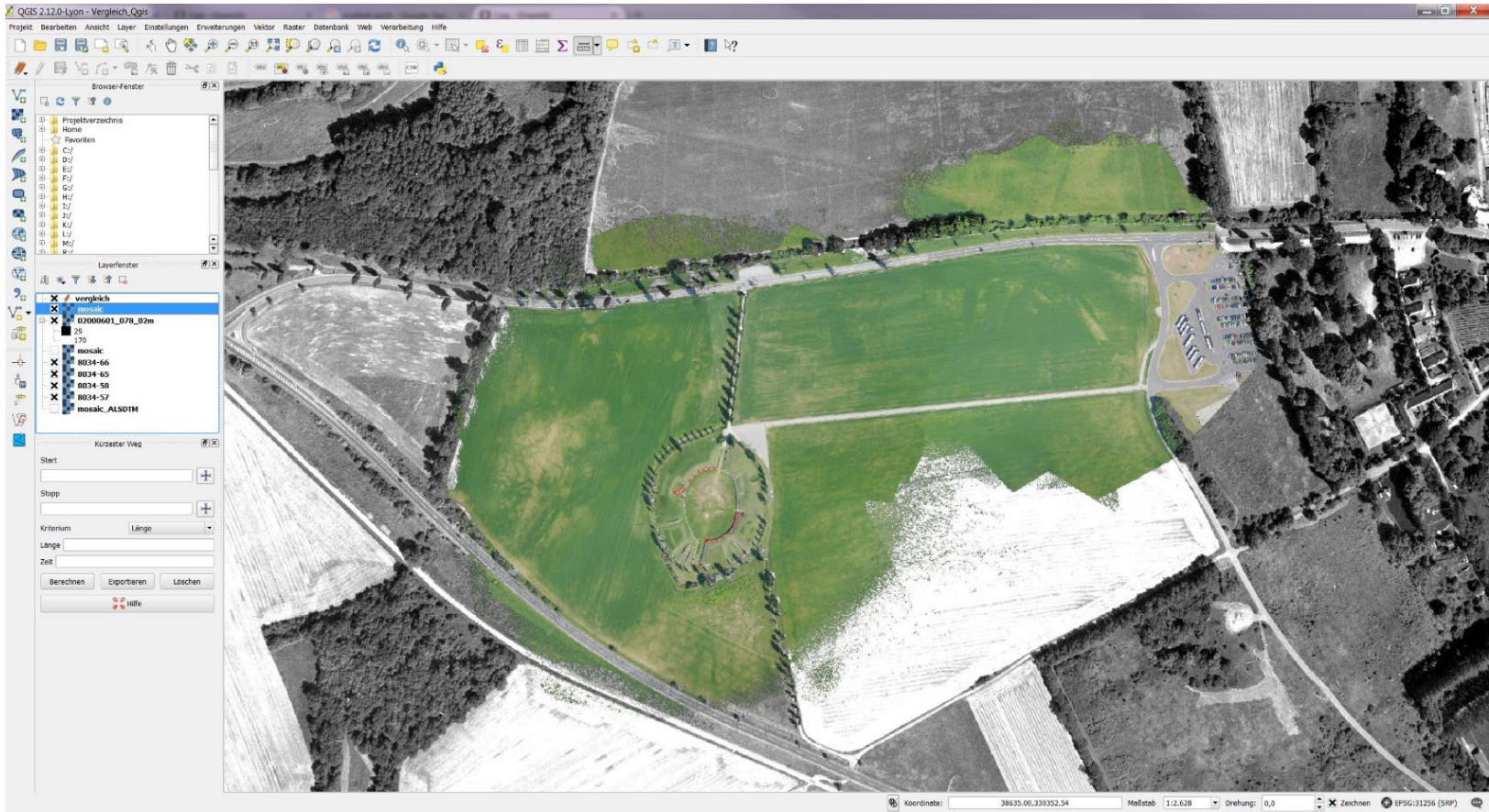
semi-autonomous & robotic systems



PRE-PROCESSING (NOT DA)

PRE-PROCESSING (NOT DA)

GEOREFERENCING – ORTHORECTIFICATION



PRE-PROCESSING (NOT DA)

GEOREFERENCING – ORTHORECTIFICATION

COORDINATE REFERENCE SYSTEMS

PRE-PROCESSING (NOT DA)

GEOREFERENCING – ORTHORECTIFICATION

COORDINATE REFERENCE SYSTEMS

DATA DIGITISATION

AutoCAD – Illustrator

PRE-PROCESSING (NOT DA)

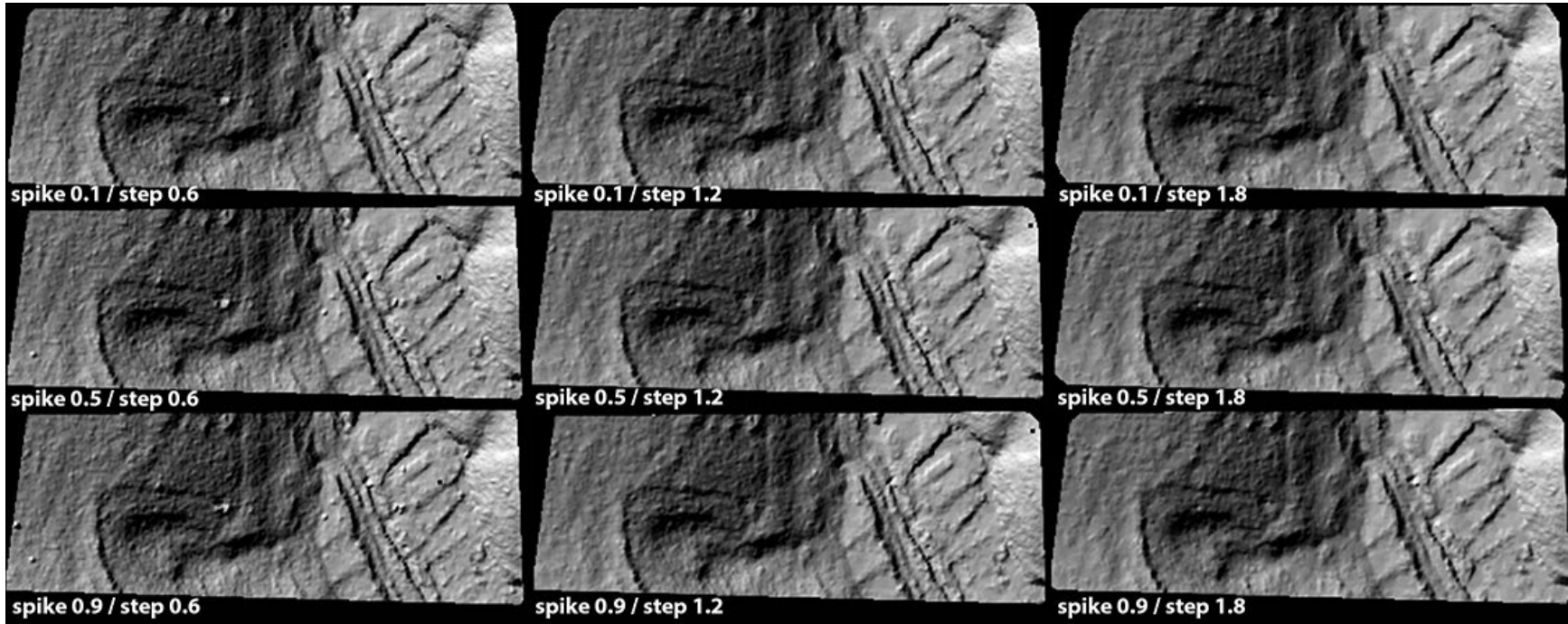
GEOREFERENCING – ORTHORECTIFICATION

COORDINATE REFERENCE SYSTEMS

DATA DIGITISATION

AutoCAD – Illustrator

POINT CLOUD FILTERING



PRE-PROCESSING (NOT DA)

GEOREFERENCING – ORTHORECTIFICATION

COORDINATE REFERENCE SYSTEMS

DATA DIGITISATION

AutoCAD – Illustrator

POINT CLOUD FILTERING

GEOPHYSICAL DATA CONDITIONING

topographic correction – bandpass filtering
amplitude visualisation

STRUCTURING

STRUCTURING

STRUCTURED FIELD RECORDING

- identifiers
- point encoding

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GIS FEATURE CLASSES

- controlled vocabularies
- field definitions with data types

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GIS FEATURE CLASSES

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~~STANDARDISED TERMINOLOGY~~

~~STABLE IDENTIFIERS~~

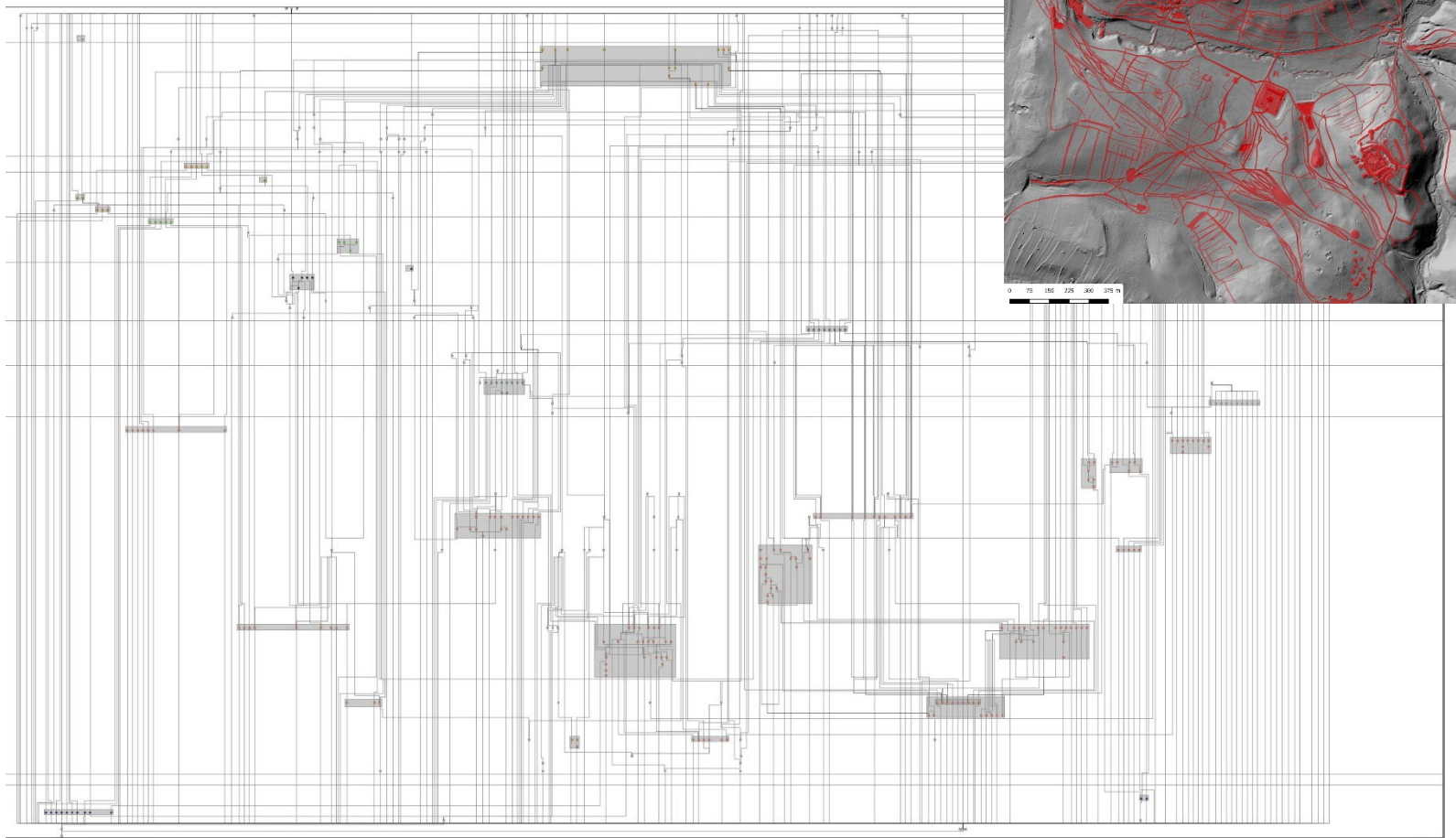
~~DATABASE DESIGN~~

~~METADATA~~

MODELLING

MODELLING

HARRIS MATRIX



MODELLING

HARRIS MATRIX

~~ONTOLOGIES~~

MODELLING

HARRIS MATRIX

~~ONTOLOGIES~~

~~KNOWLEDGE GRAPHS~~

ANALYSING

analytical visualisation



transformational processing



statistical analysis



ANALYSING

GEOPHYSICAL DATA VISUALISATION

time-slice compilations

analytical visualisation

transformational processing

statistical analysis

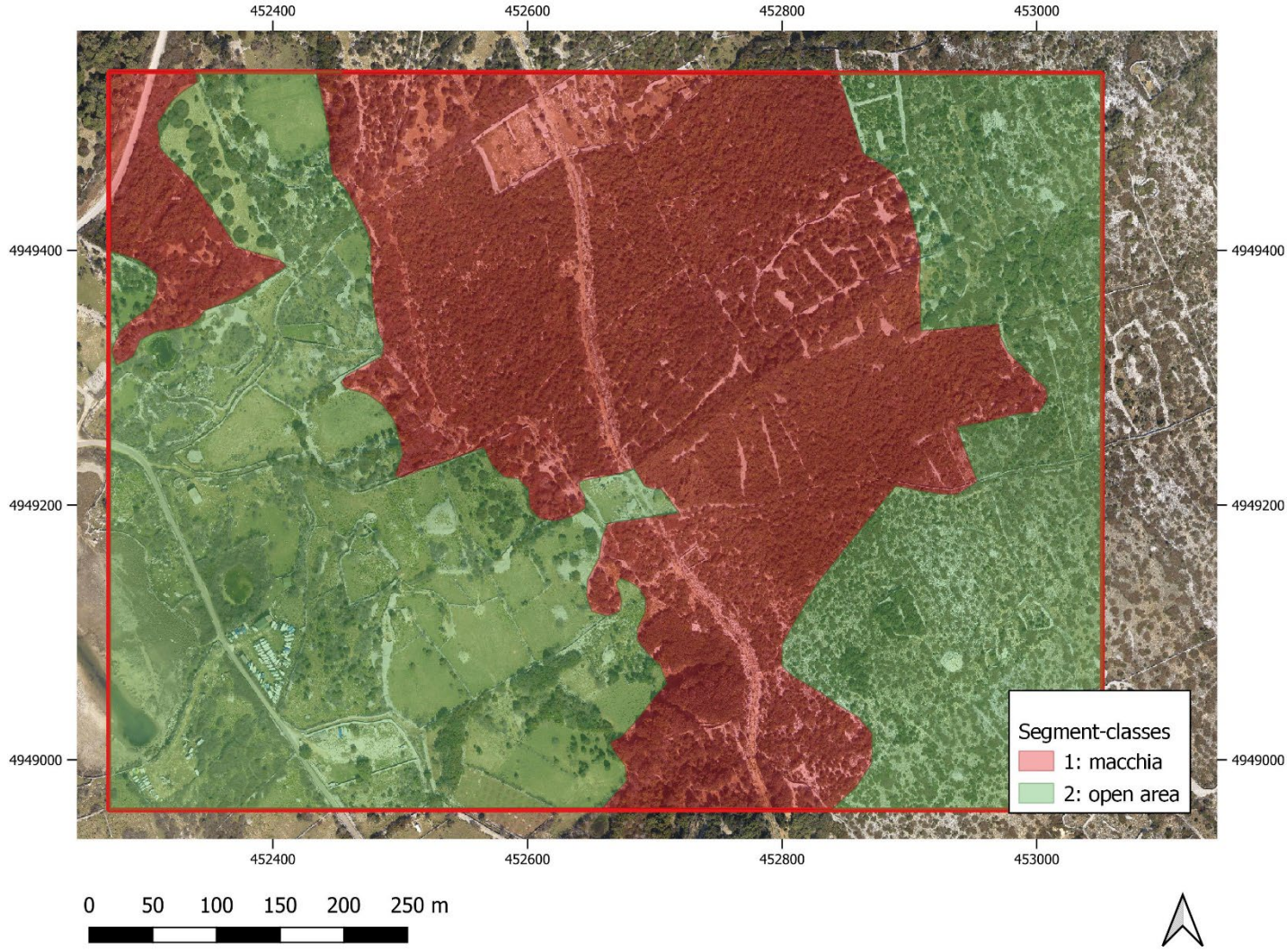
ANALYSING

GEOPHYSICAL DATA VISUALISATION

time-slice compilations

POINT CLOUD VISUALISATION

classification-coloured renderings



ANALYSING

GEOPHYSICAL DATA VISUALISATION

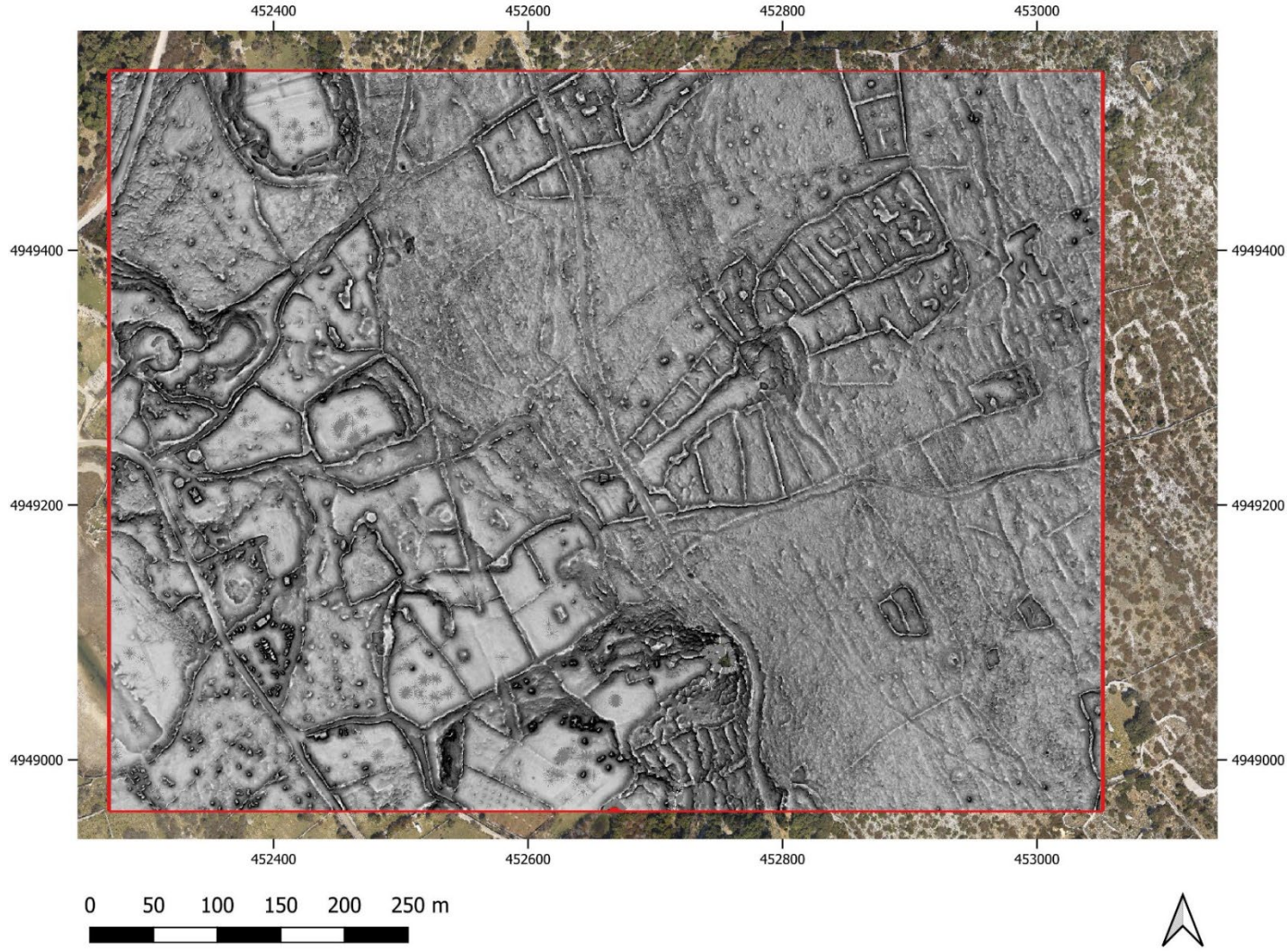
time-slice compilations

POINT CLOUD VISUALISATION

classification-coloured renderings

TERRAIN VISUALISATION

Relief Visualisation Toolbox



ANALYSING

ALS / TLS PROCESSING

point cloud classification
terrain modelling

analytical visualisation

transformational processing

statistical analysis

ANALYSING

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GEOPHYSICAL DATA PROCESSING

depth-slice extraction

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ANALYSING

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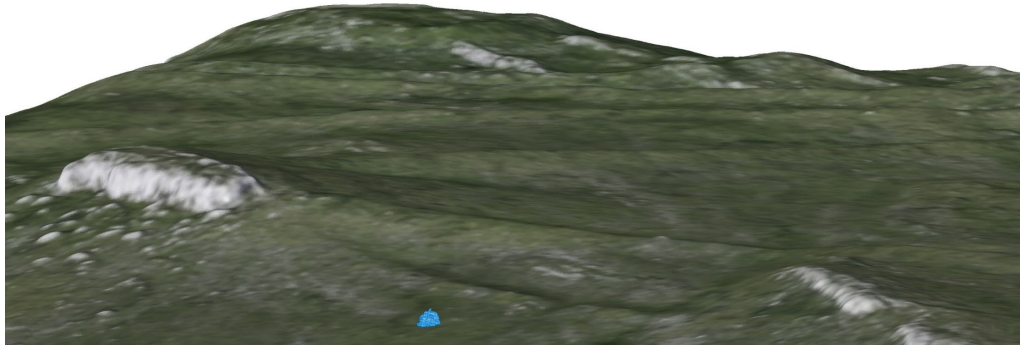
IMAGE-BASED 3D CONSTRUCTION

artefact – site – landscape

archival & new imagery







ANALYSING

ALS / TLS PROCESSING

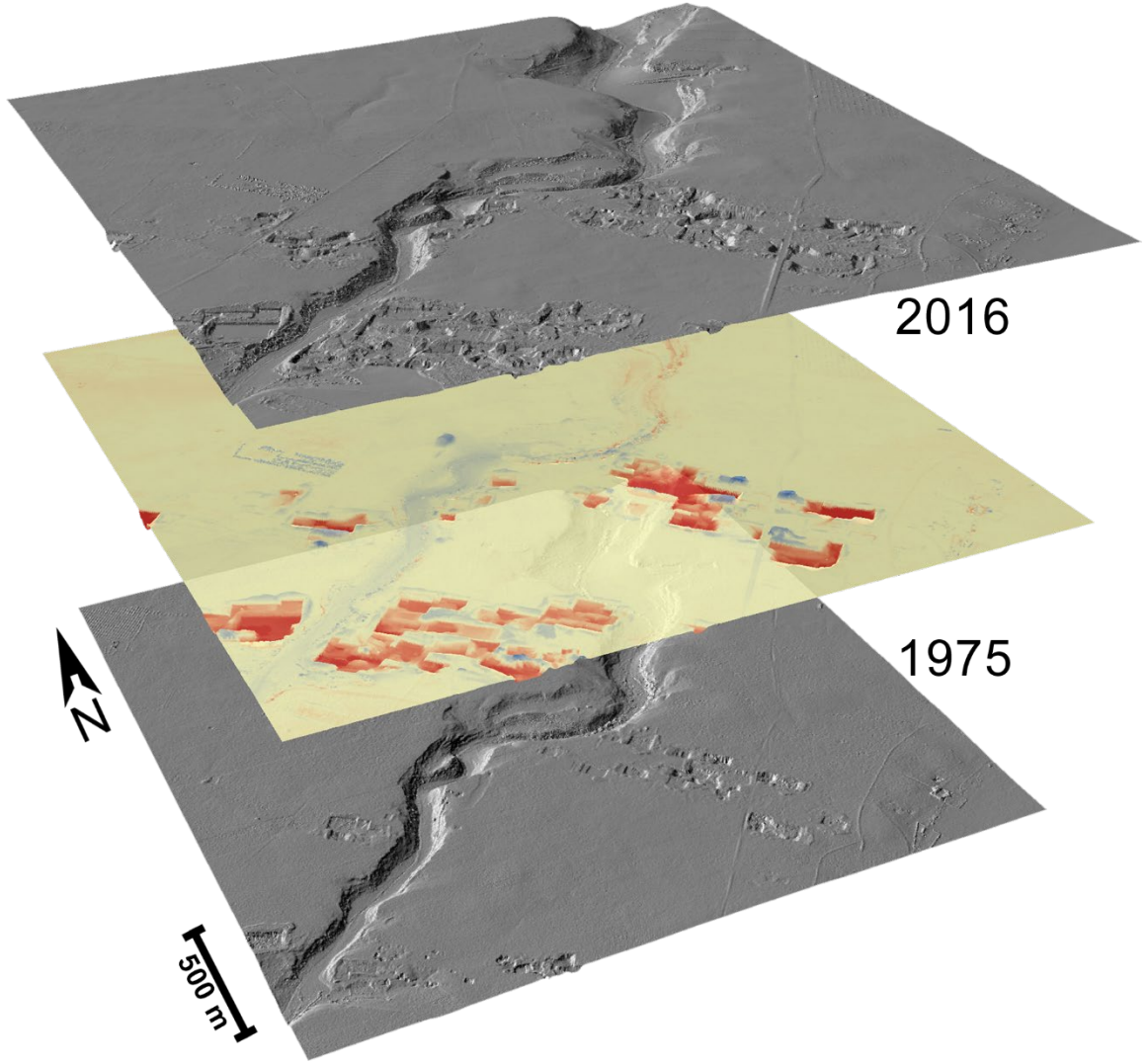
point cloud classification
terrain modelling

GEOPHYSICAL DATA PROCESSING

depth-slice extraction

IMAGE-BASED 3D CONSTRUCTION

artefact – site – landscape
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ANALYSING

ALS / TLS PROCESSING

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terrain modelling

GEOPHYSICAL DATA PROCESSING

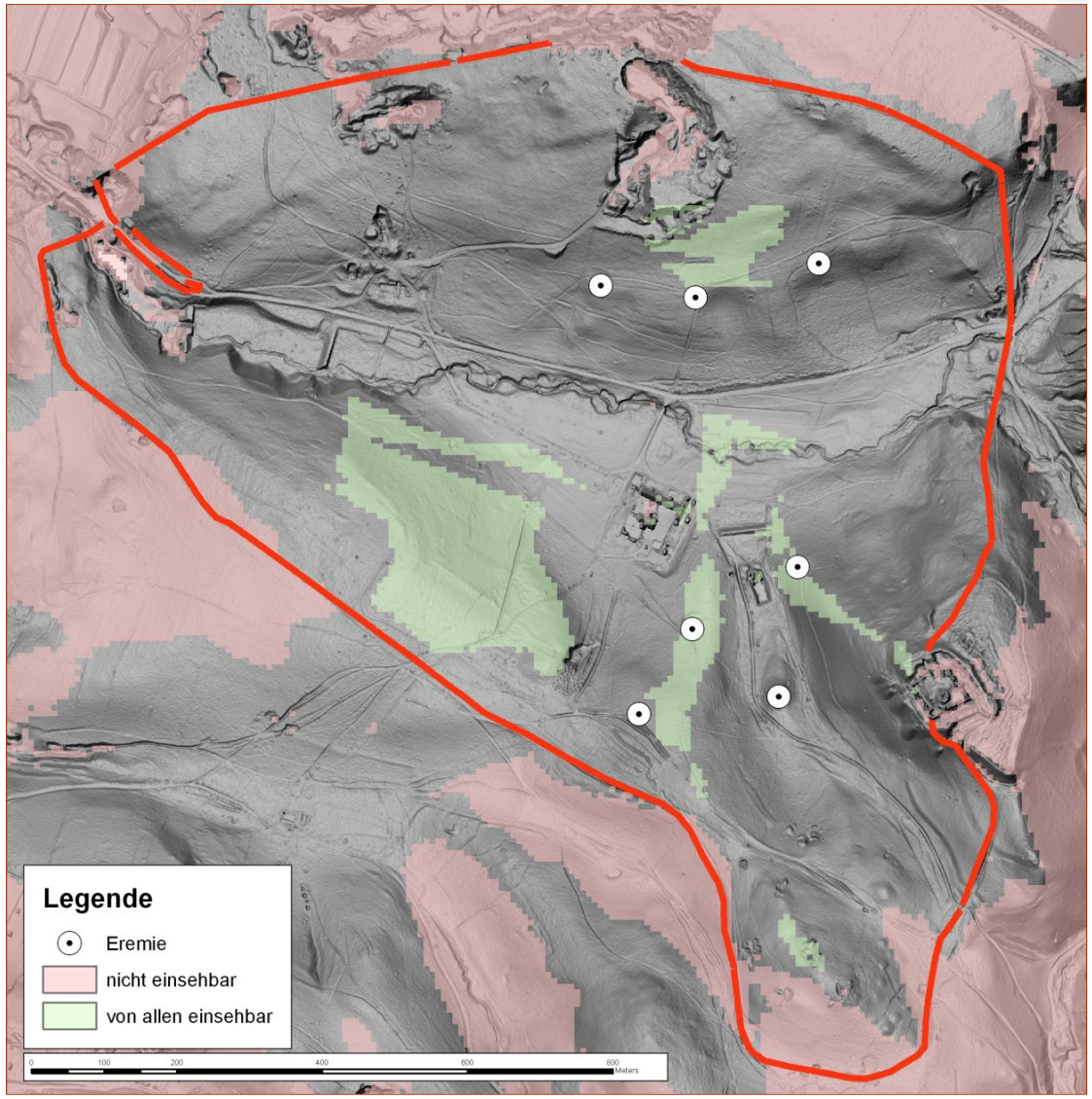
depth-slice extraction

IMAGE-BASED 3D CONSTRUCTION

artefact – site – landscape
archival & new imagery

GIS-BASED SPATIAL MODELLING

viewsheds – least-cost path



ANALYSING

EXPLORATORY STATISTICS

analytical visualisation

transformational processing

statistical analysis

ANALYSING

EXPLORATORY STATISTICS

BASIC GIS-BASED SPATIAL ANALYSIS

- point patterns

analytical visualisation

transformational processing

statistical analysis



ANALYSING

EXPLORATORY STATISTICS

BASIC GIS-BASED SPATIAL ANALYSIS

point patterns

~~CLUSTER ANALYSIS~~

~~CORRESPONDENCE ANALYSIS~~

~~MACHINE LEARNING~~

analytical visualisation

transformational processing

statistical analysis



INTERPRETATION (BOUNDARY DA)

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GIS-BASED INTERPRETATION

- aerial images
- ALS
- geophysical data
- historical maps





PROJECTS







2021 – 2023



contemporary graffiti



Heritage Science Austria


ventory


IN ventory and
di sseminate

Inventory and disseminate graffiti

Inventory and

disseminate

graffiti along the

d**o**naukanal

Inventory and disseminate graffiti along the donaukanal



IN ventory and
di sseminate
9 raffiti along the
d O naukanal





Inventory and Disseminate Graffiti along the Donaukanal







Inventory and disseminate graffiti along the donaukanal









IN ventory and
di sseminate
9 raffiti along the
do naukanal











Inventory and disseminate graffiti along the donaukanal





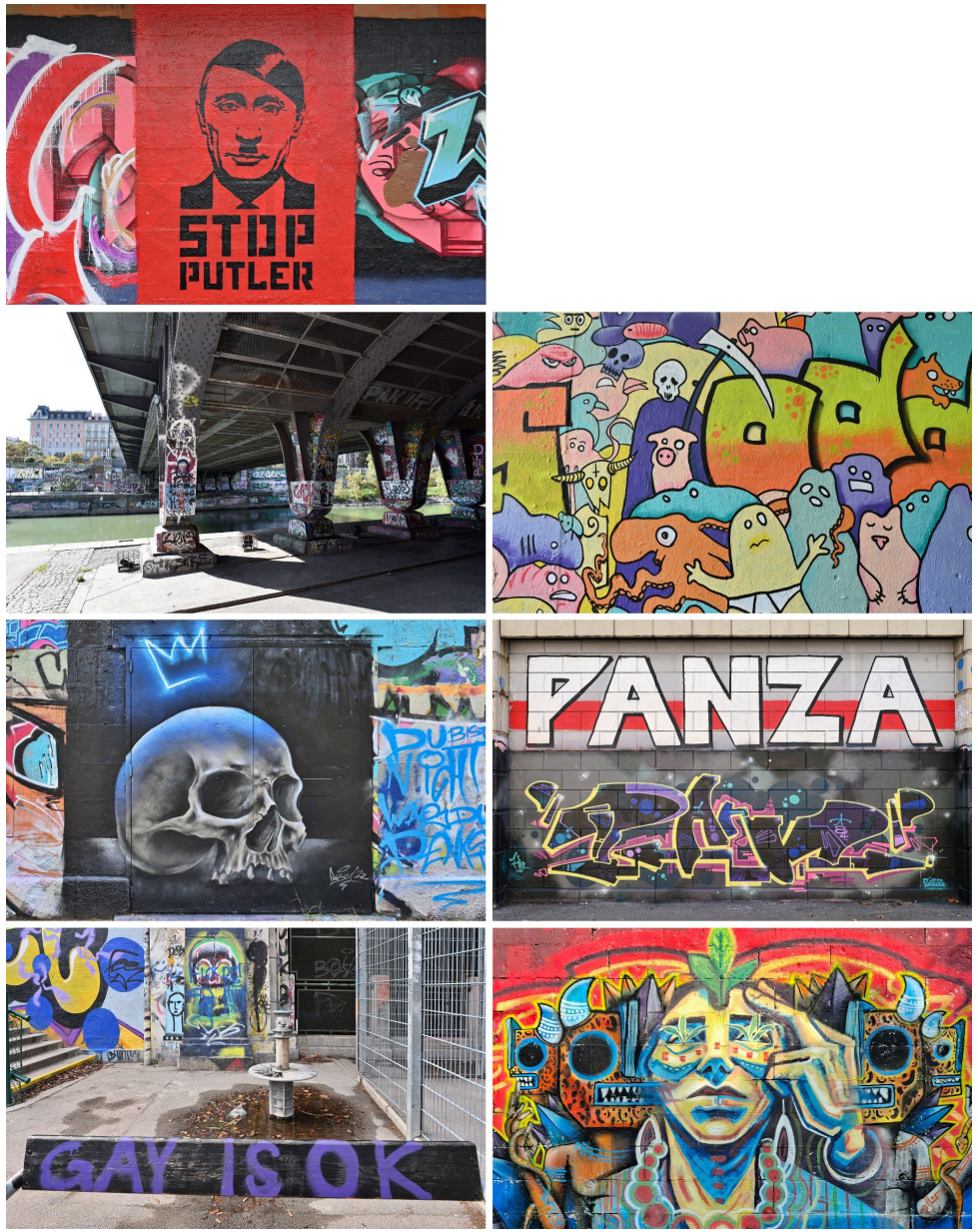




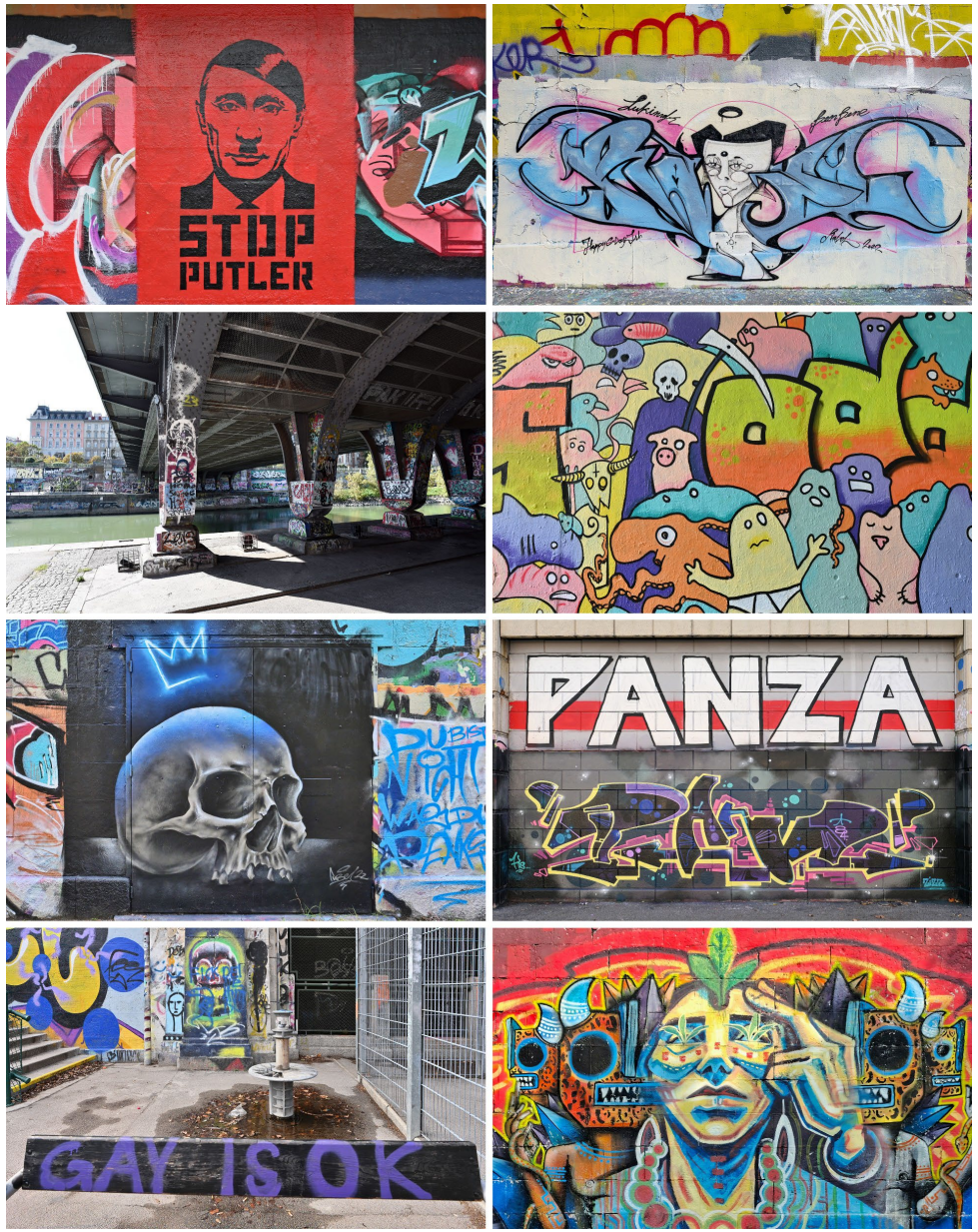




Inventory and disseminate graffiti along the donaukanal



Inventory and disseminate graffiti along the donaukanal

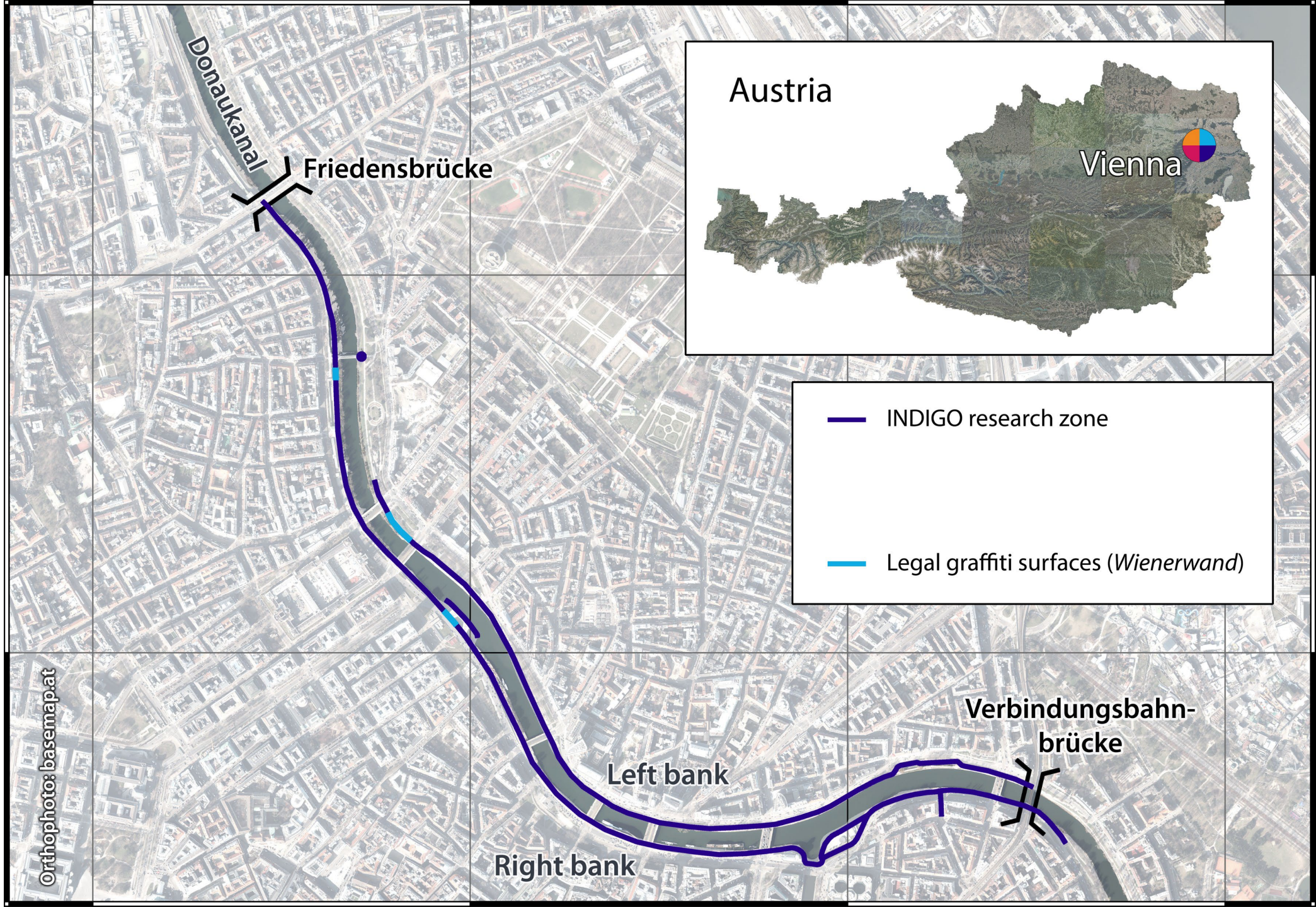


LEGAL SURFACES

0.3 km

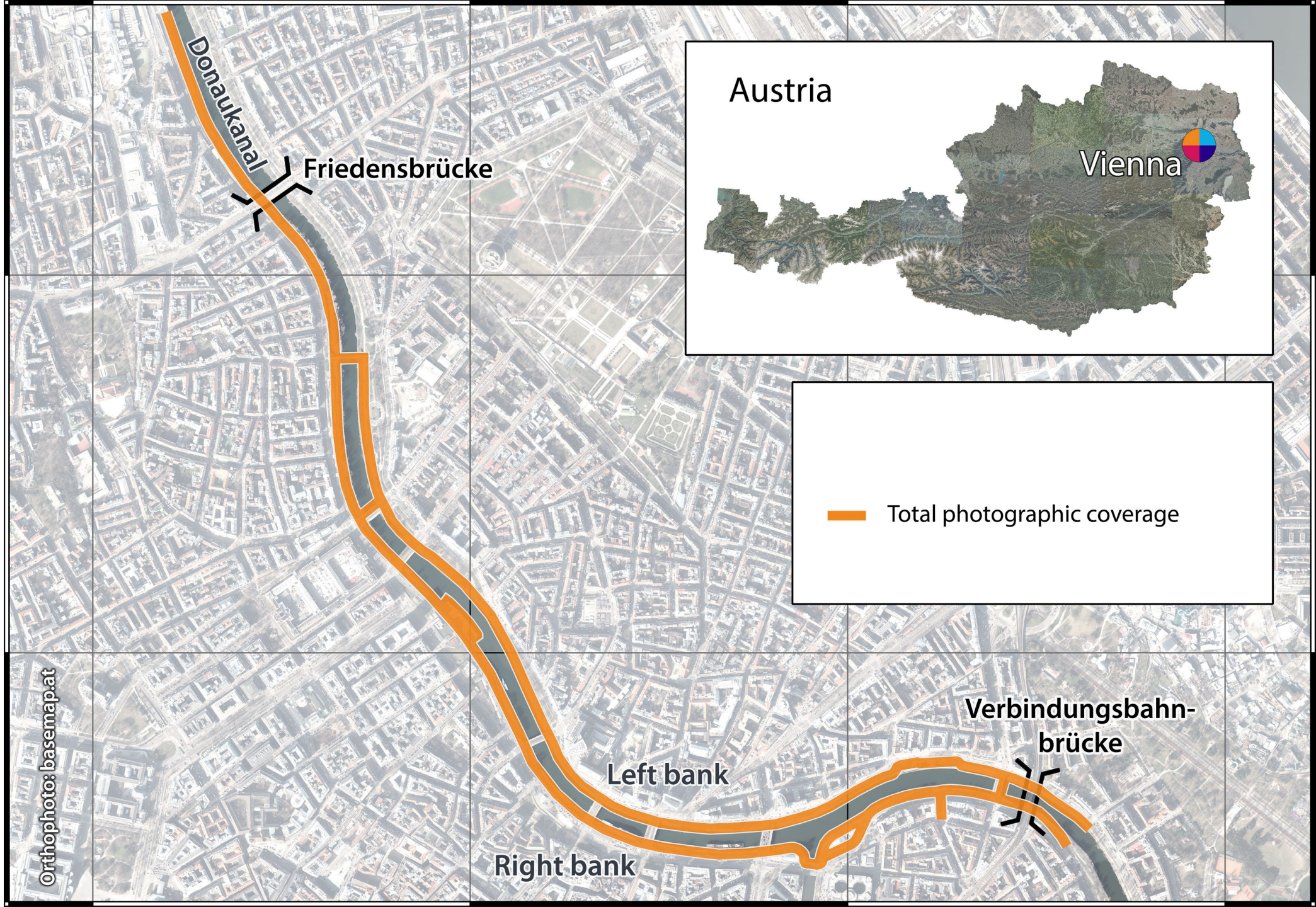
MONITORED SURFACES

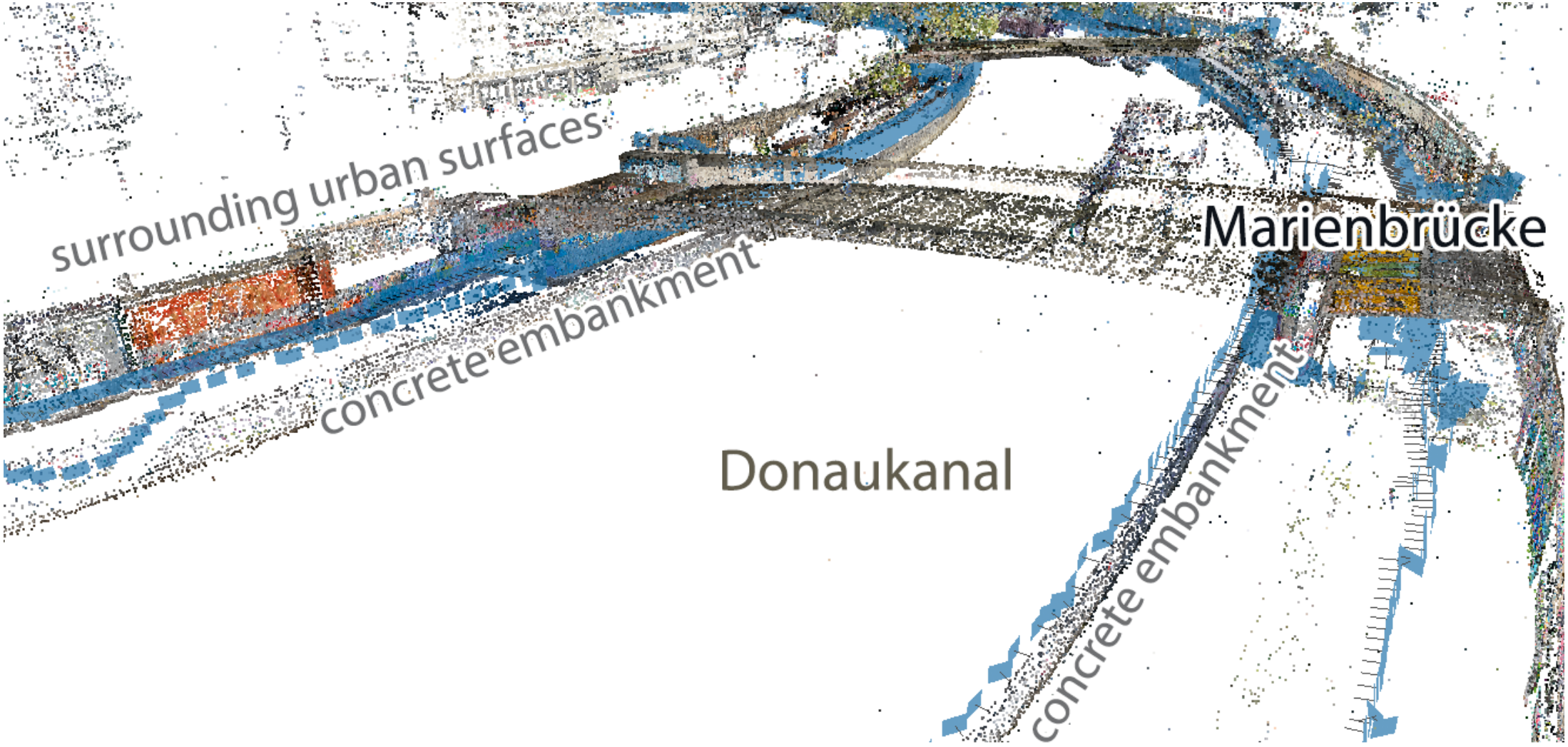
12.9 km



TOTAL COVERAGE

14.0 km



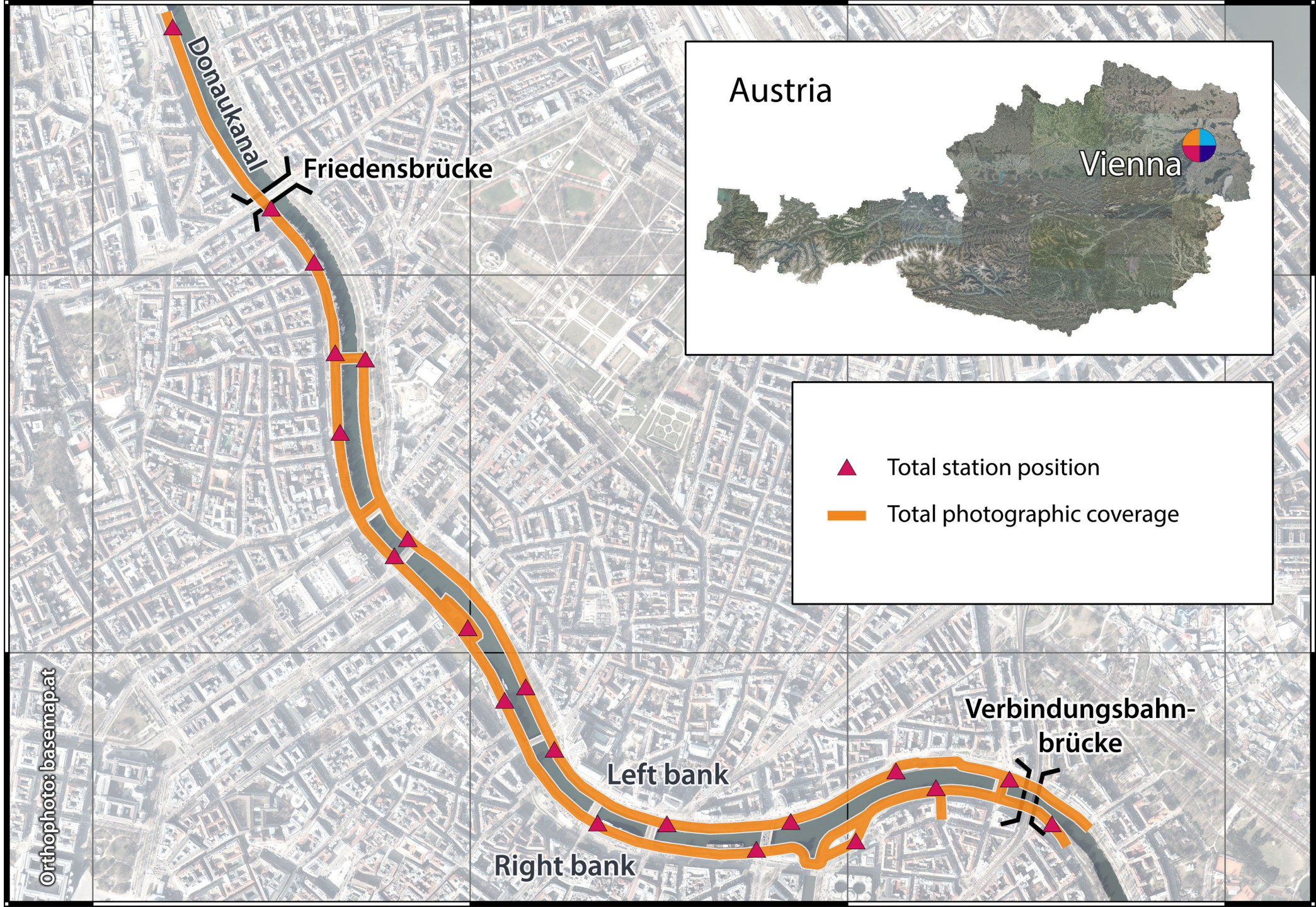

surrounding urban surfaces
concrete embankment
Marienbrücke
Donaukanal
concrete embankment

TOTAL COVERAGE

14.0 km

TOTAL STATION POSITIONS

21



TOTAL COVERAGE

14.0 km

TOTAL STATION POSITIONS

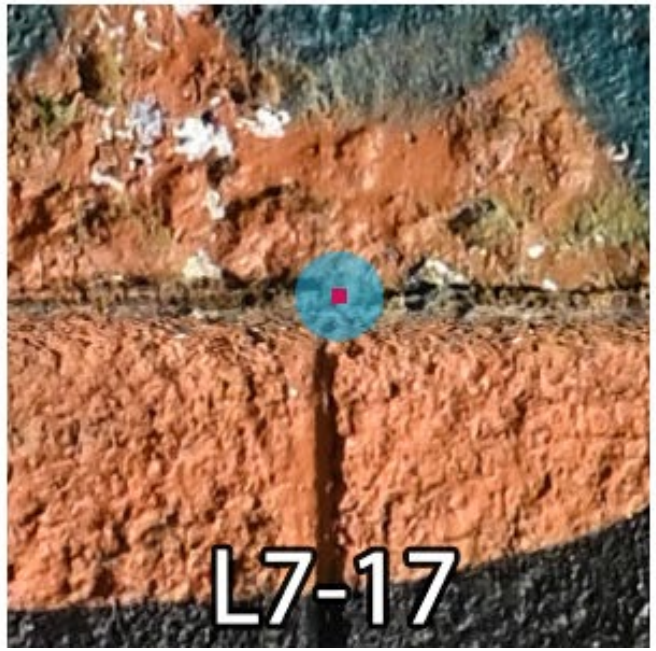
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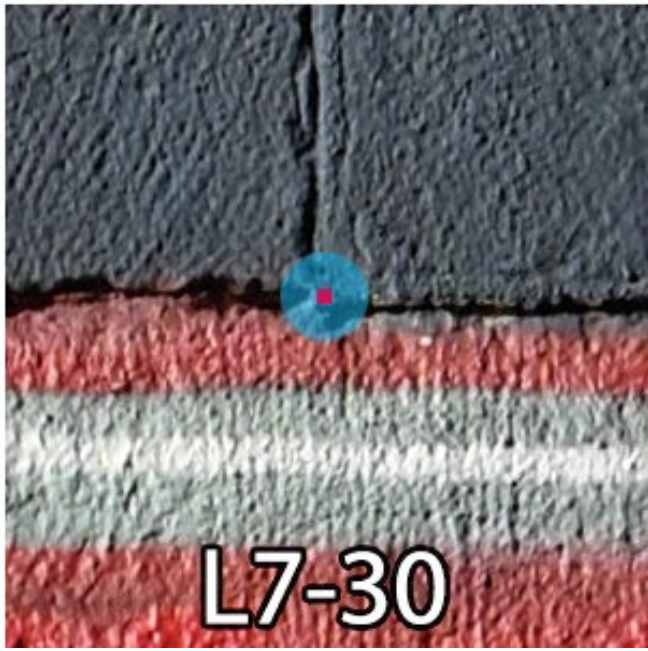
GRAFFITI-SCAPE POINTS

624







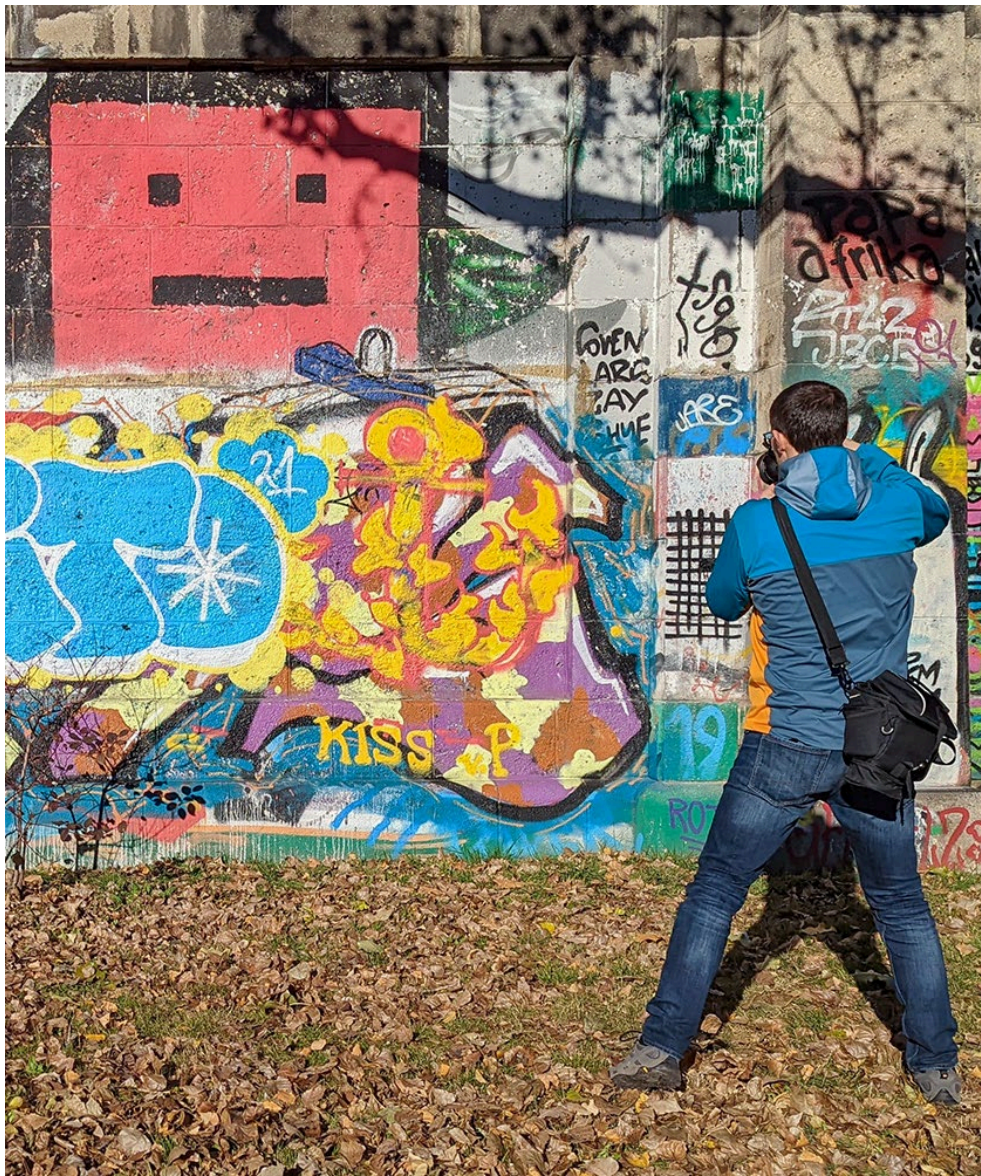




TOTAL COVERAGE

TOTAL COVERAGE

WEEKLY FOLLOW-UP



TOTAL COVERAGE

WEEKLY FOLLOW-UP



TOTAL COVERAGE

WEEKLY FOLLOW-UP

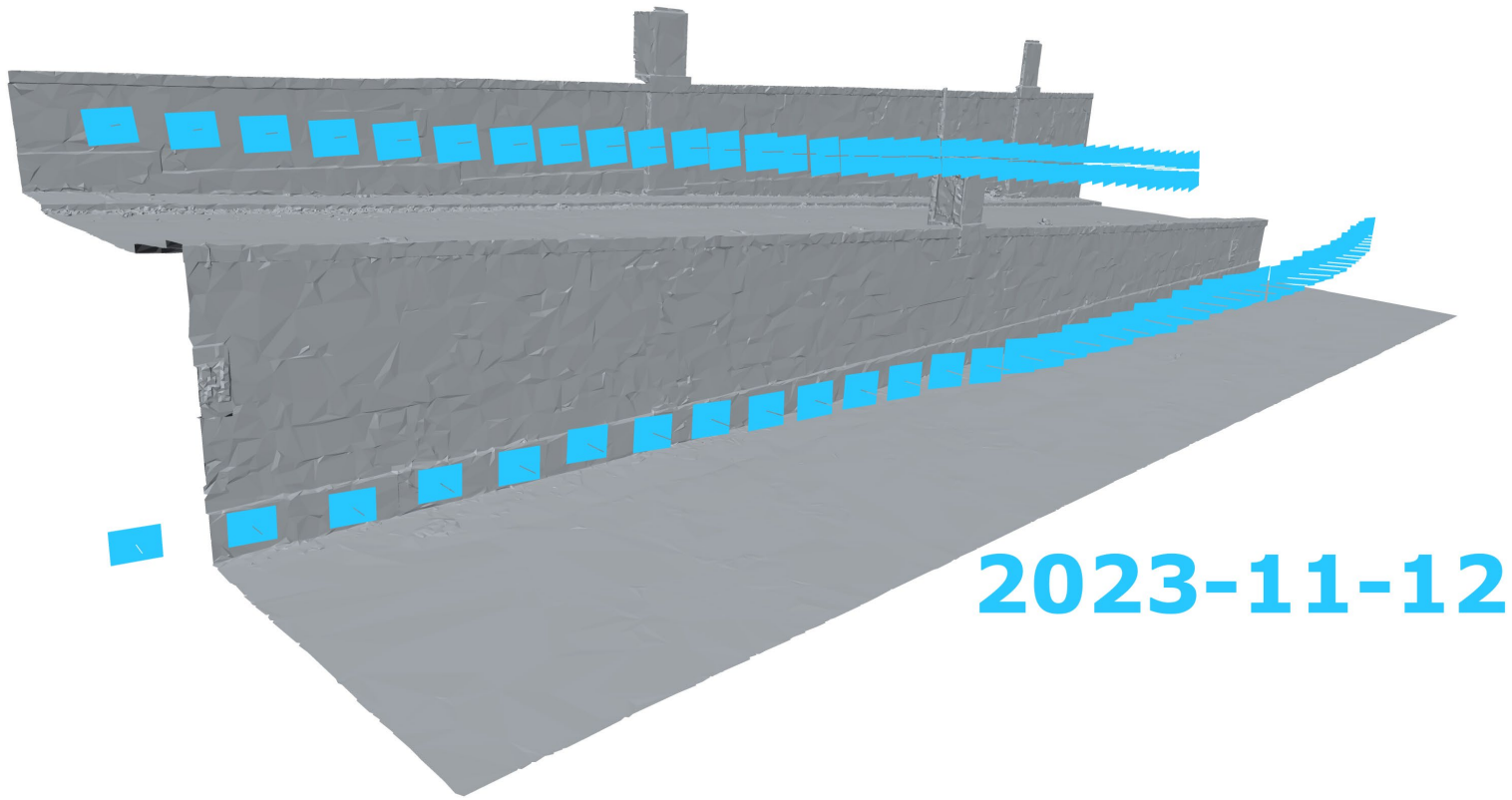




TOTAL COVERAGE

WEEKLY FOLLOW-UP

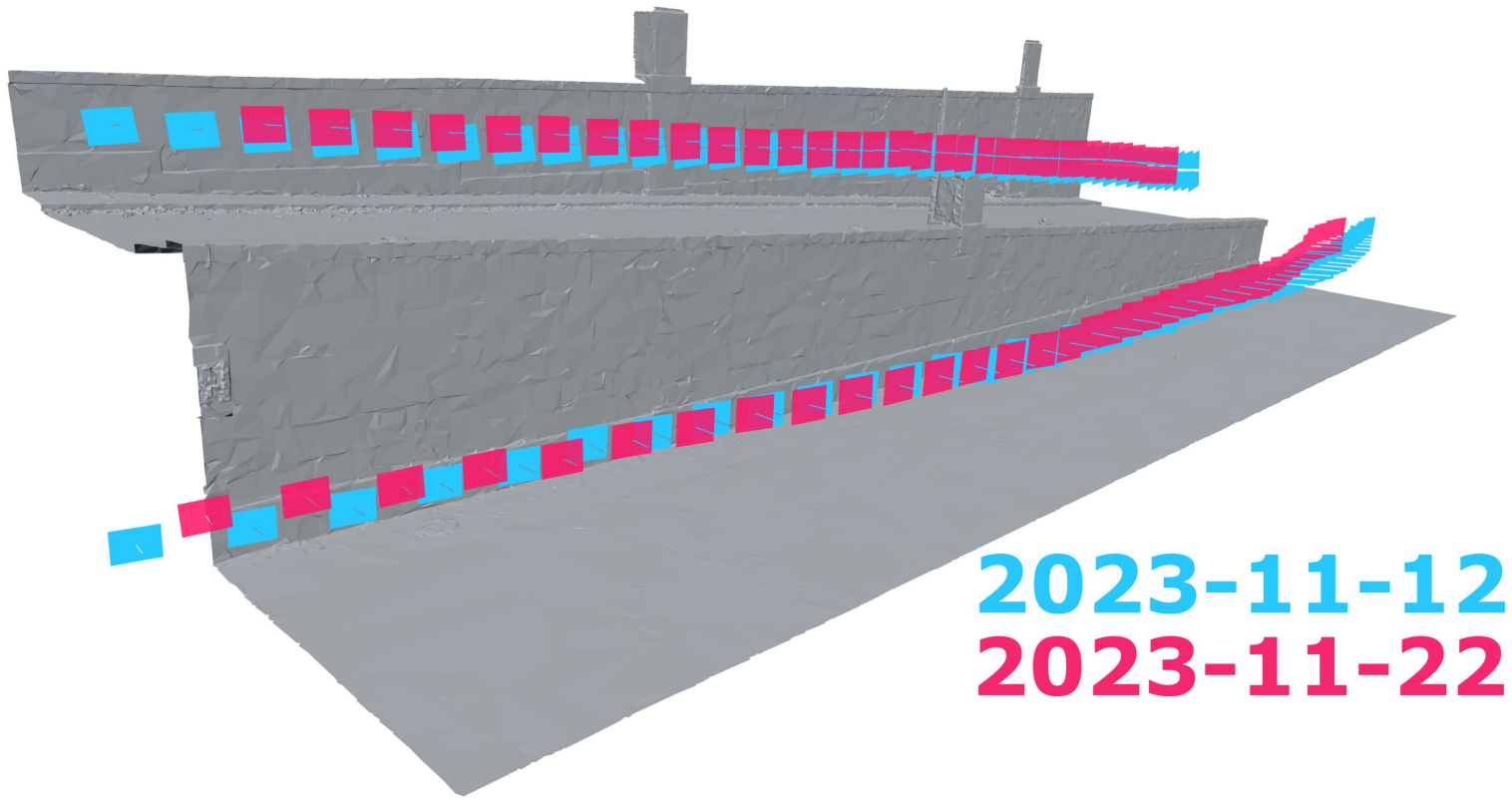
AUTO-POSITIONED



TOTAL COVERAGE

WEEKLY FOLLOW-UP

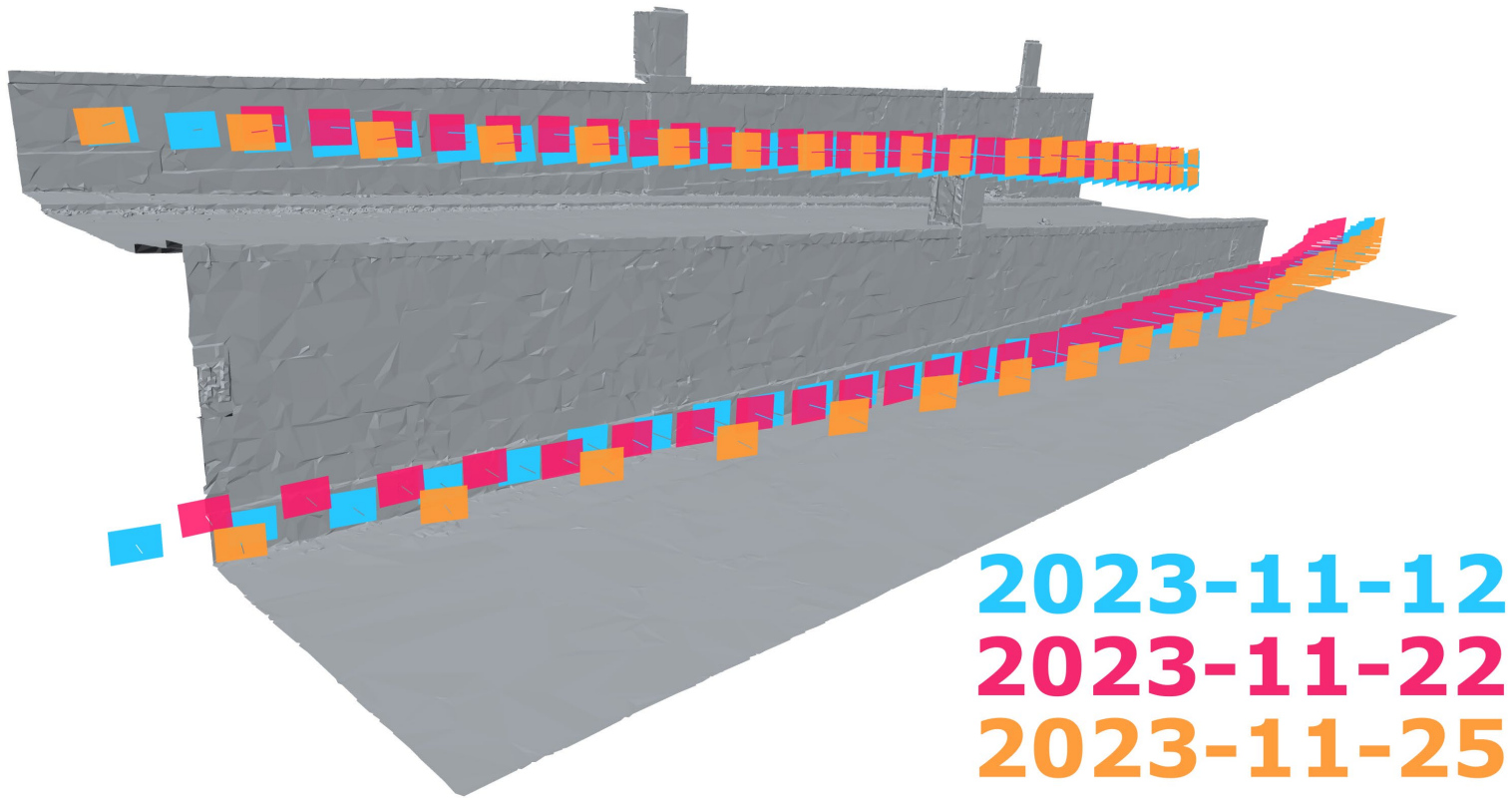
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TOTAL COVERAGE

WEEKLY FOLLOW-UP

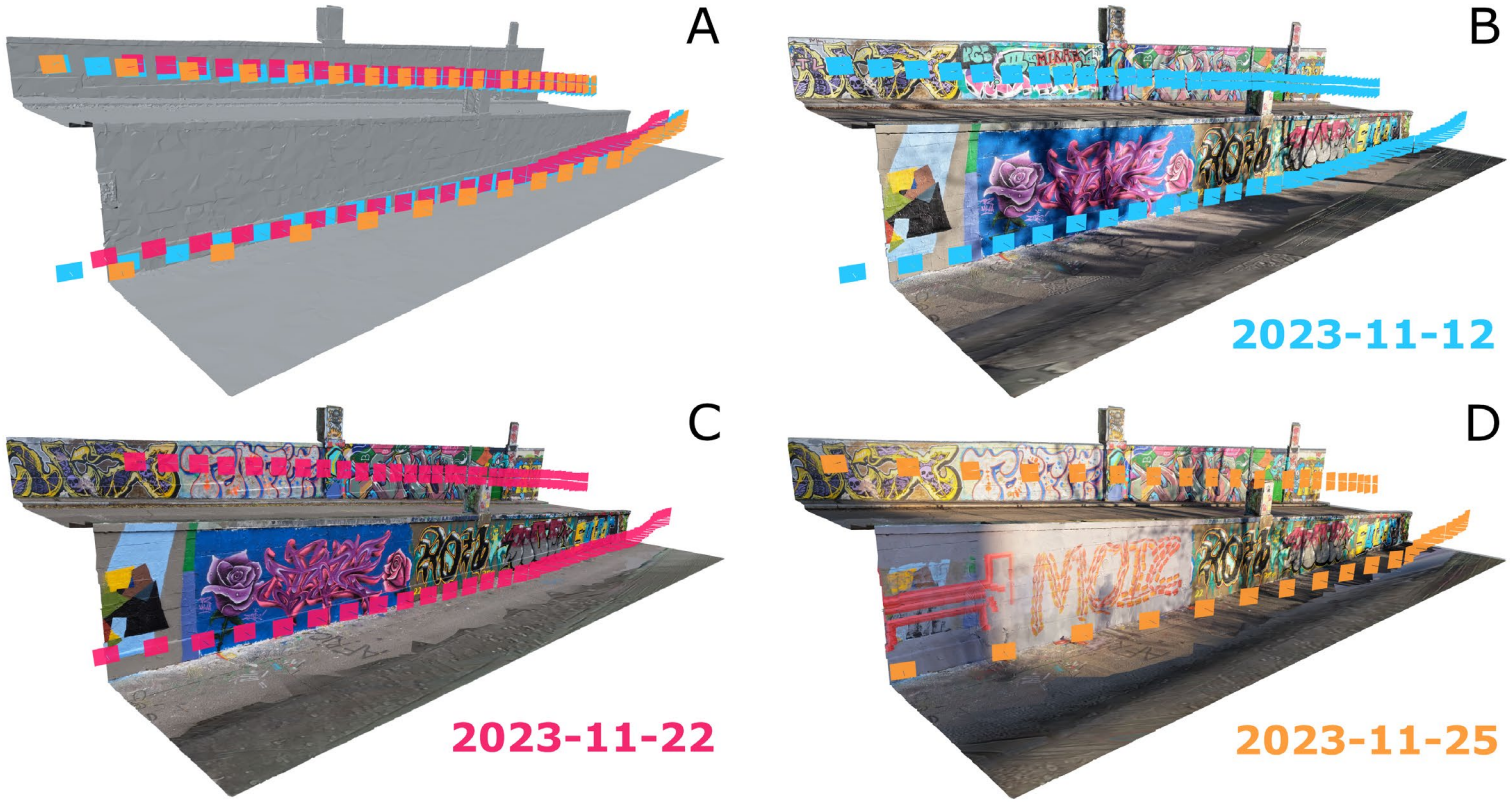
AUTO-POSITIONED



TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED



indigo

TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

AUTOGRAF

indigo

TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

COLOUR-CORRECTED

COOLPi

indigo

TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

COLOUR-CORRECTED

METADATA ANNOTATED

GRAPHIS

GRAPHIS

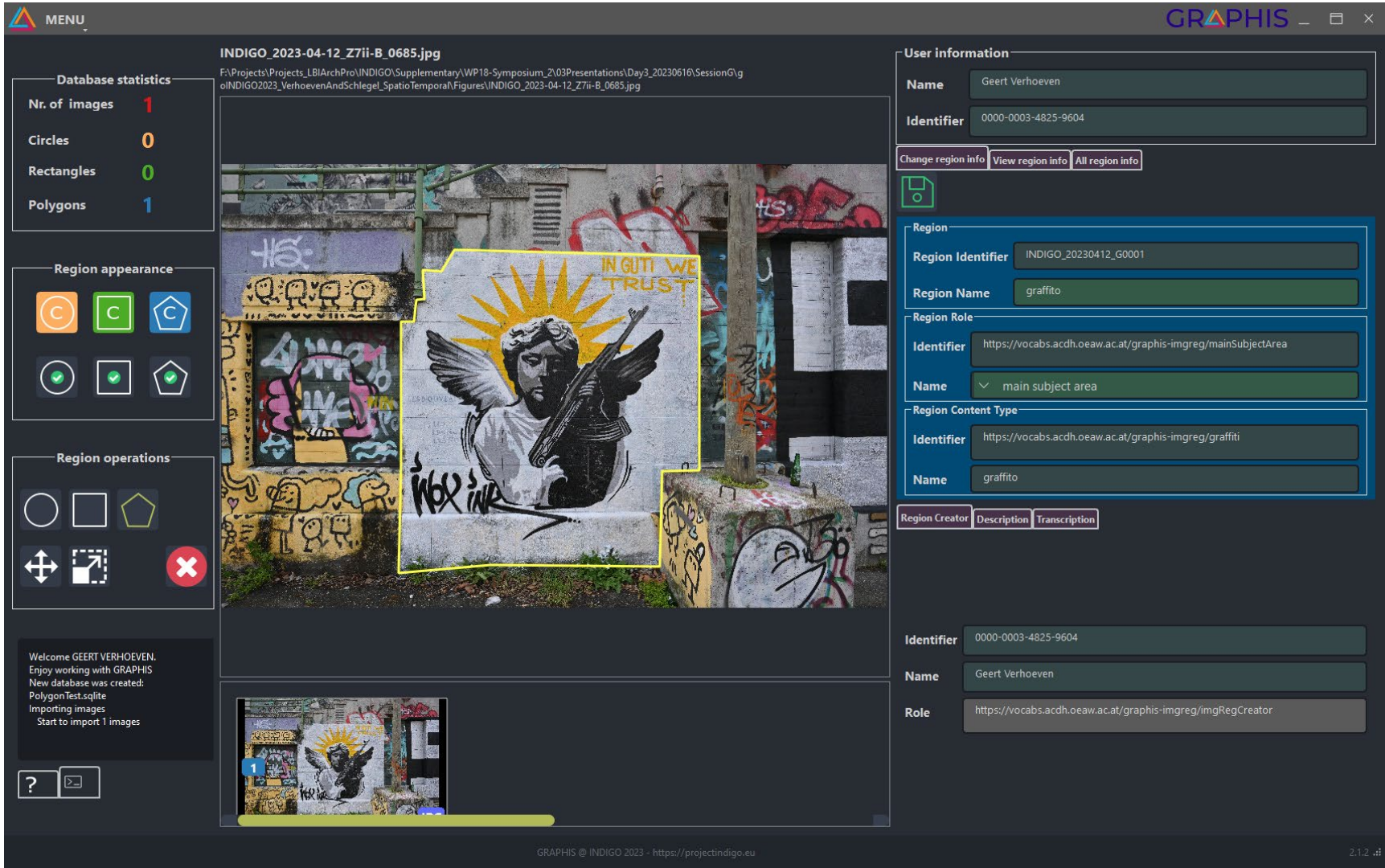
TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

COLOUR-CORRECTED

METADATA ANNOTATED



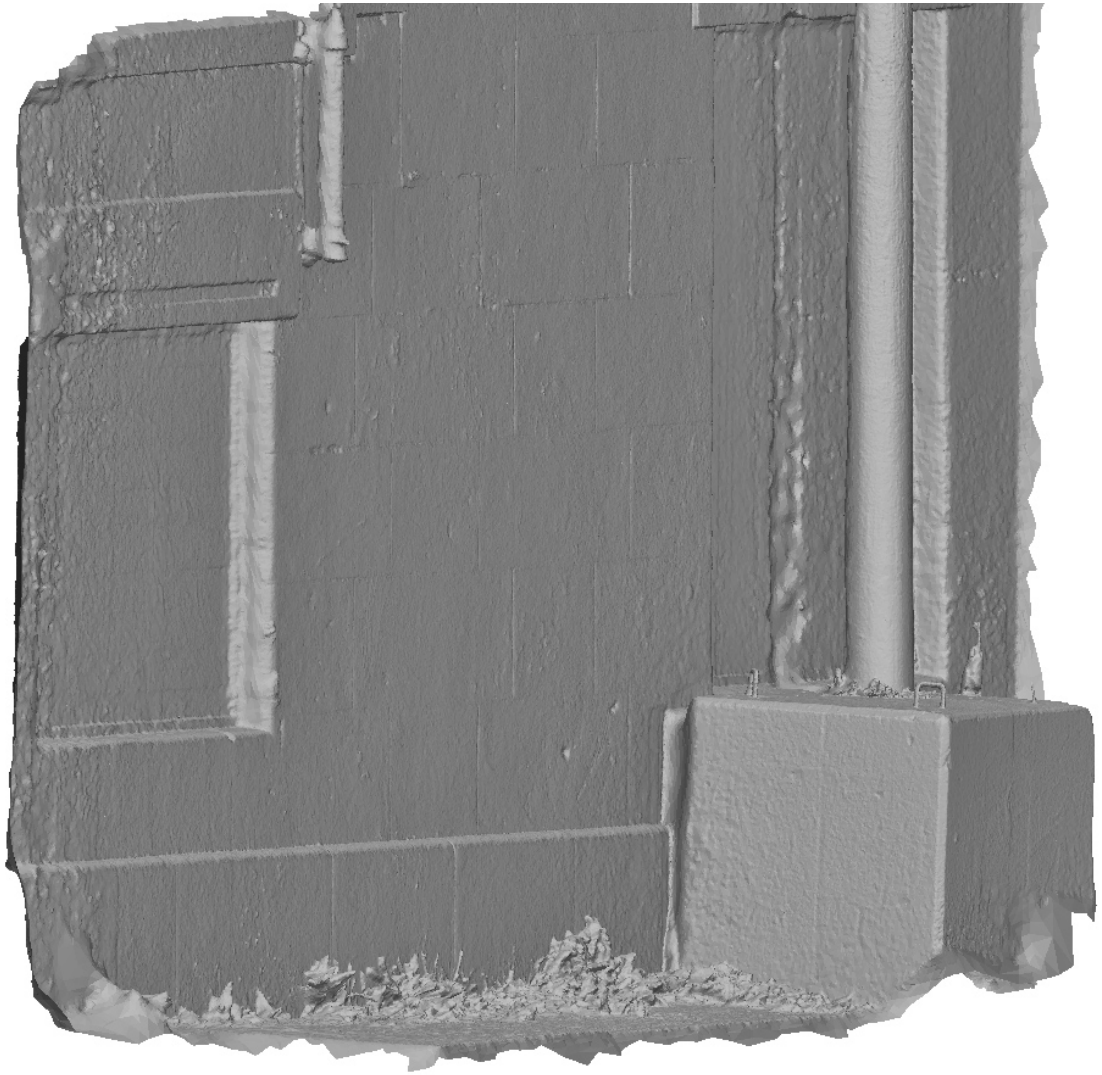
TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

COLOUR-CORRECTED

METADATA ANNOTATED



TOTAL COVERAGE

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METADATA ANNOTATED



TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

COLOUR-CORRECTED

METADATA ANNOTATED





TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

COLOUR-CORRECTED

METADATA ANNOTATED

TRACK TEMPORALITY


2022-09-05 10:20


2022-09-05 10:20

2022-09-12 12:36
I NEED AMMO!


2022-09-05 10:20


2022-09-12 12:36
I NEED AMMO!


2022-09-14 09:45


2022-09-05 10:20
2022-09-12 12:36
I NEED AMMO!
2022-09-14 09:45
2022-09-21 17:05


2022-09-05 10:20
2022-09-12 12:36
I NEED AMMO!
2022-09-14 09:45
2022-09-21 17:05




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```
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```

```
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  "maximum":
}
```




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  "latest":
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"span": {
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    "maximum":
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```




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TOTAL COVERAGE

WEEKLY FOLLOW-UP

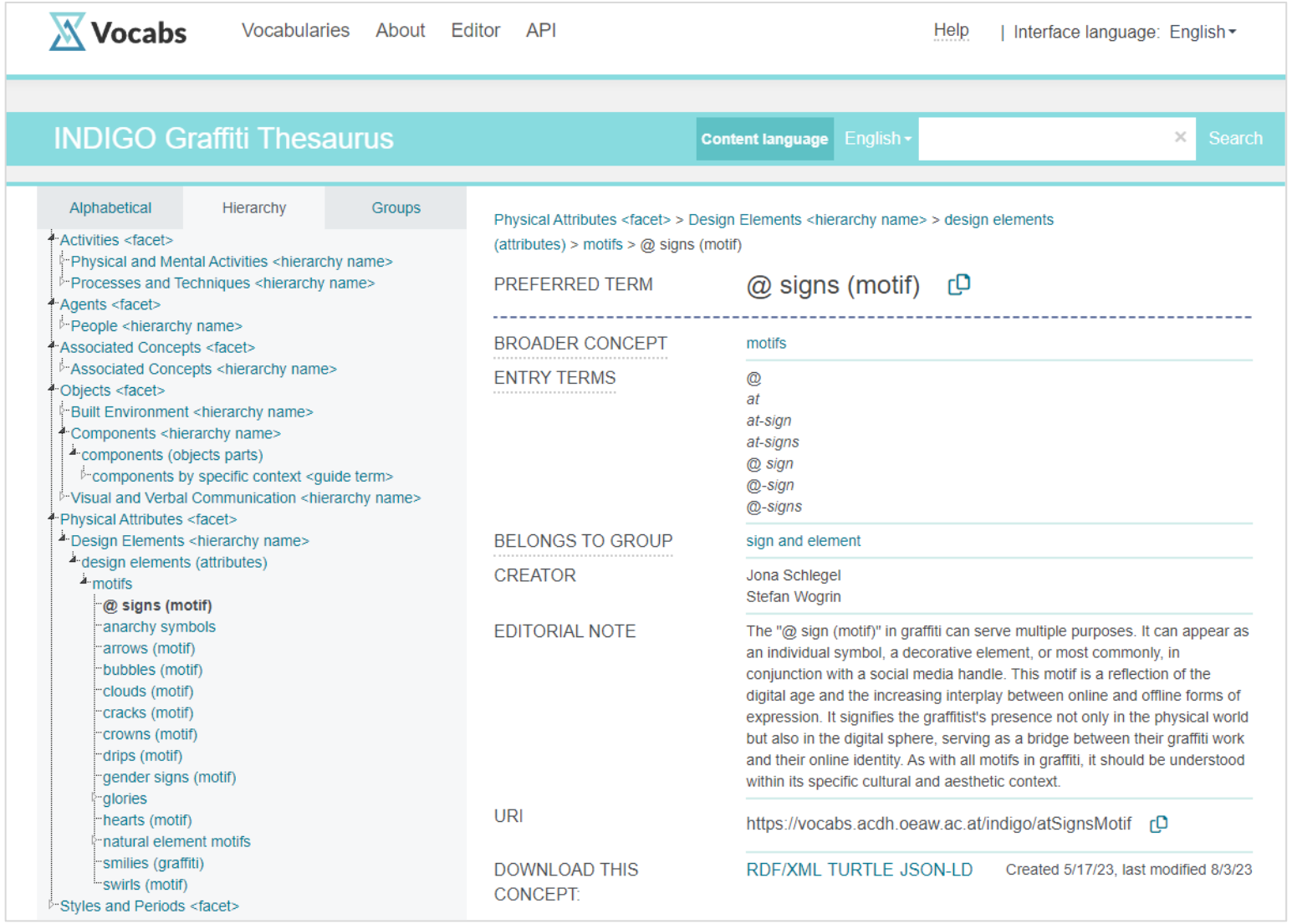
AUTO-POSITIONED

COLOUR-CORRECTED

METADATA ANNOTATED

TRACK TEMPORALITY

THESAURI





TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

COLOUR-CORRECTED

METADATA ANNOTATED

TRACK TEMPORALITY

THESAURI

TOTAL COVERAGE

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METADATA ANNOTATED

TRACK TEMPORALITY

THESAURI

indigo 2.0

TOTAL COVERAGE

WEEKLY FOLLOW-UP

AUTO-POSITIONED

CHANGE DETECTION

AUTOGRAF

COLOUR-CORRECTED

COLOUR EXTRACTION
THESAURUS

HUEnique

METADATA ANNOTATED

AUTO-SEGMENTATION
SPEECH-TO-TEXT

GRAPHIS

TRACK TEMPORALITY

TEMPORAL DEDUCTION
TIME-AWARE ONTOLOGY

POLYGRAF

THESAURI

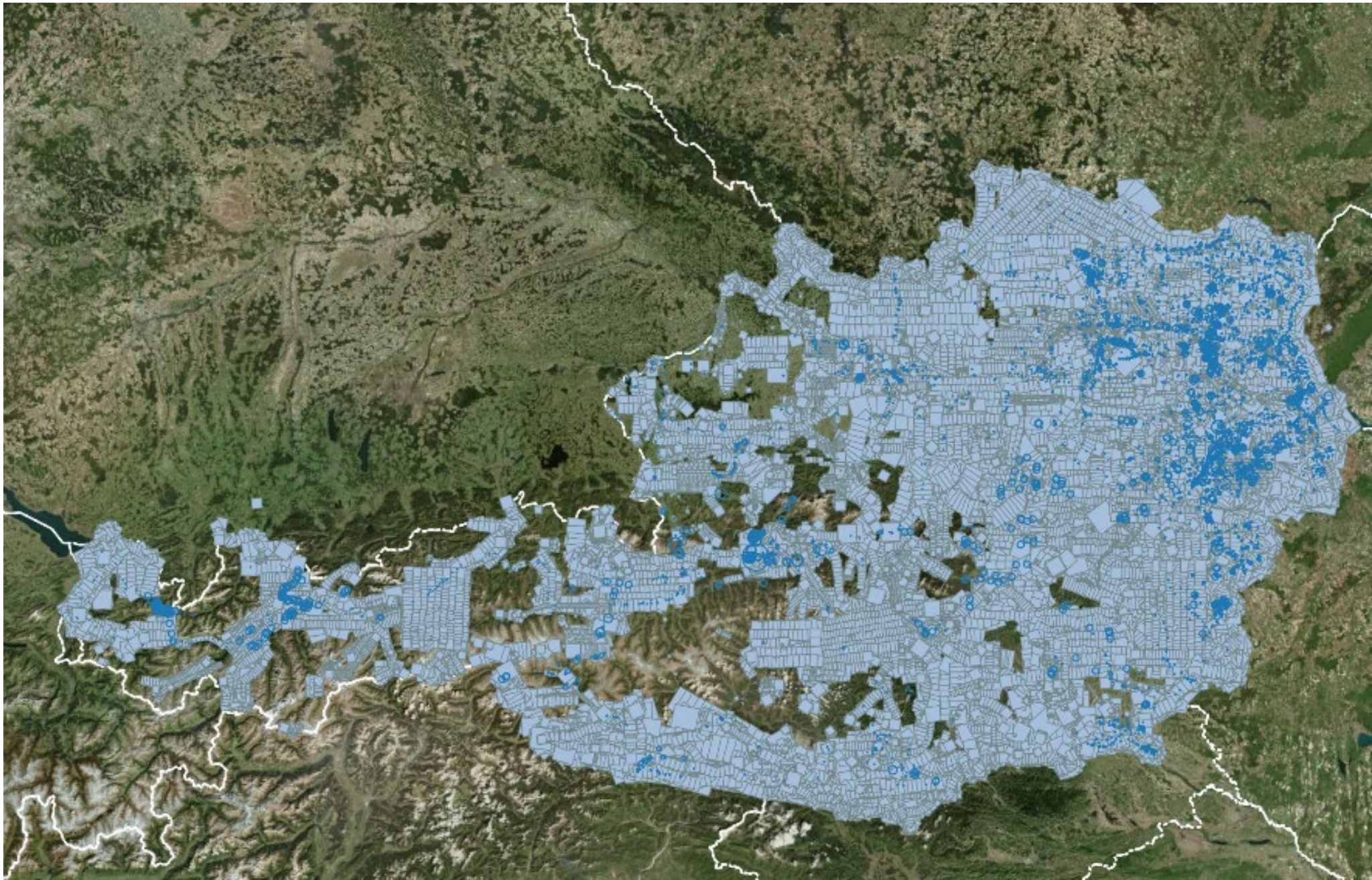
GRAPH DATABASE

urban chameleon

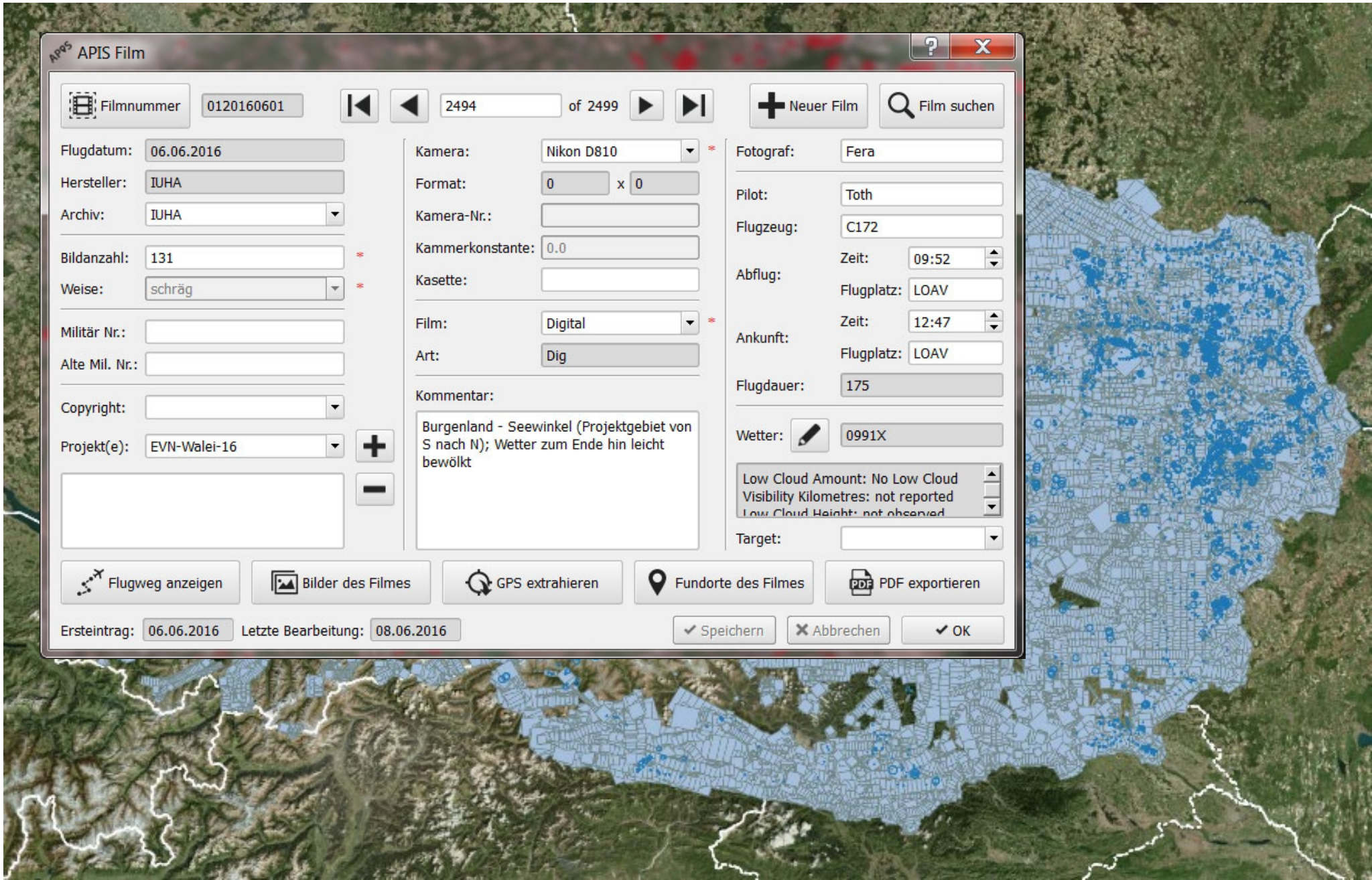


OPPORTUNITIES

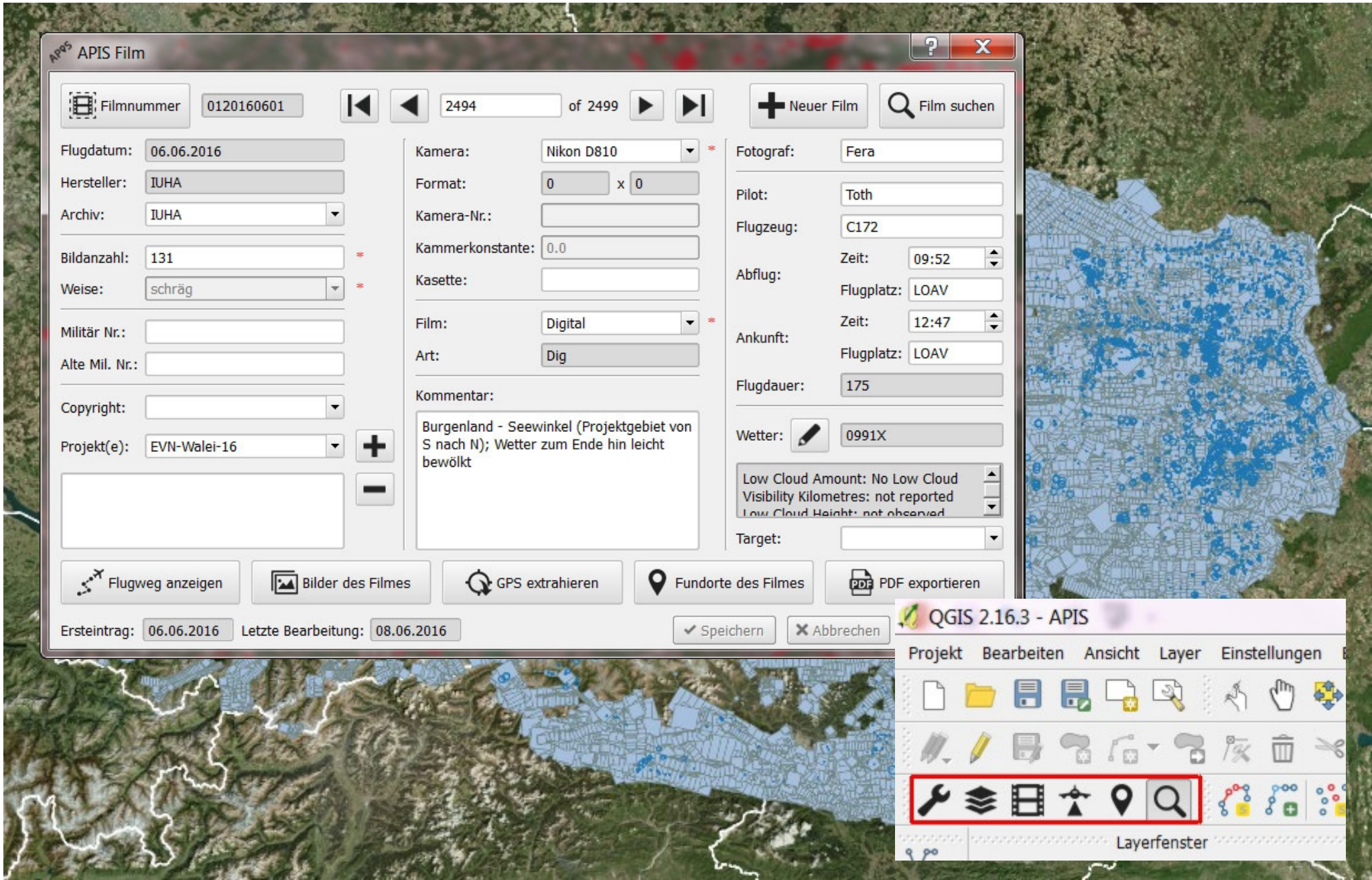
APIS



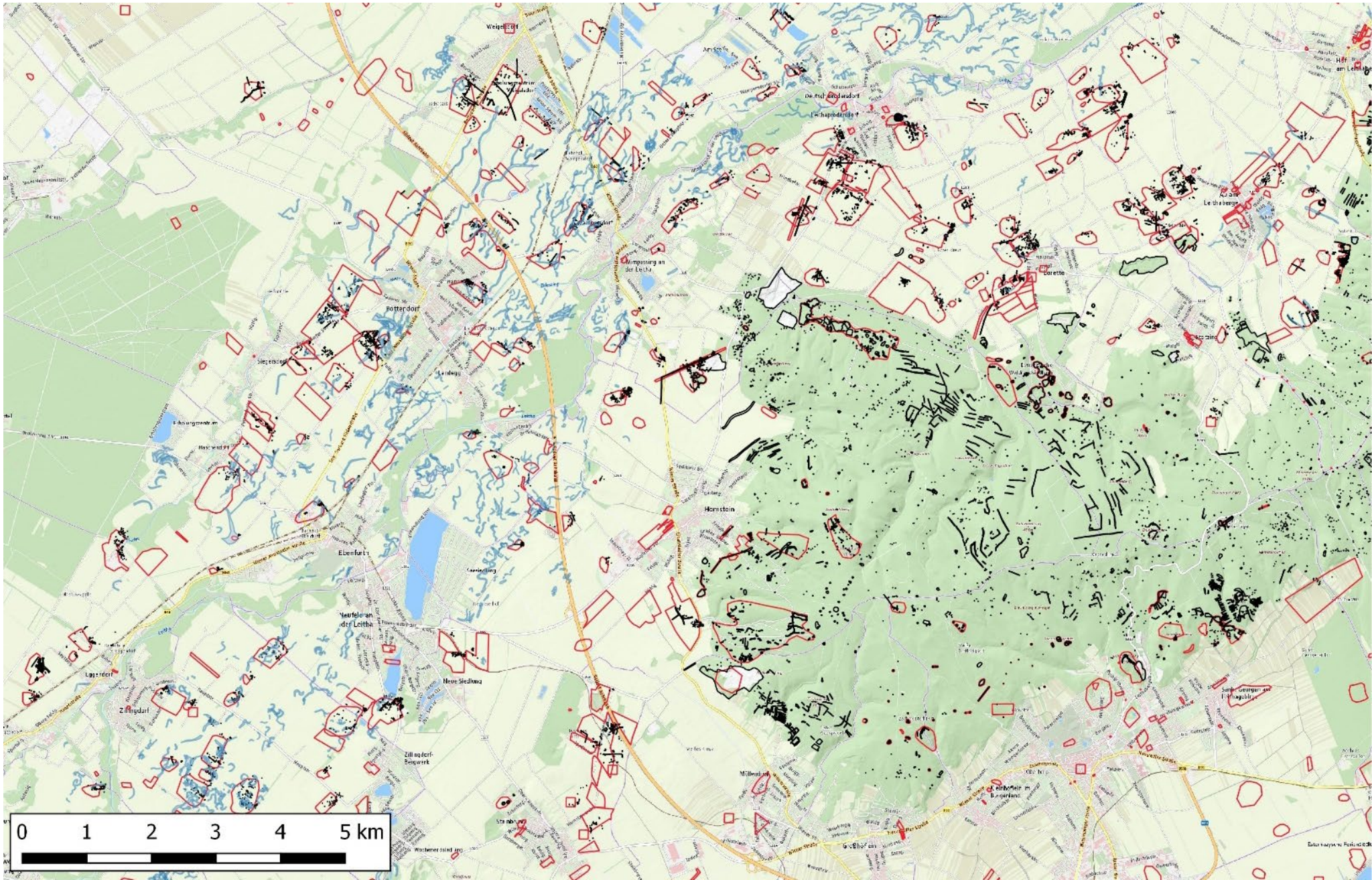
APIS


APIS Film
Filmnummer
0120160601
2494
of 2499
Neuer Film
Film suchen
Flugdatum:
06.06.2016
Hersteller:
IUHA
Archiv:
IUHA
Bildanzahl:
131
Weise:
schräg
Militär Nr.:
Alte Mil. Nr.:
Copyright:
Projekt(e):
EVN-Walei-16
Kamera:
Nikon D810
Format:
0
x
0
Kamera-Nr.:
Kammerkonstante:
0.0
Kasette:
Film:
Digital
Art:
Dig
Kommentar:
Burgenland - Seewinkel (Projektgebiet von S nach N); Wetter zum Ende hin leicht bewölkt
Fotograf:
Fera
Pilot:
Toth
Flugzeug:
C172
Abflug:
Zeit:
09:52
Flugplatz:
LOAV
Ankunft:
Zeit:
12:47
Flugplatz:
LOAV
Flugdauer:
175
Wetter:
0991X
Low Cloud Amount: No Low Cloud
Visibility Kilometres: not reported
Target:
Flugweg anzeigen
Bilder des Filmes
GPS extrahieren
Fundorte des Filmes
PDF exportieren
Ersteintrag:
06.06.2016
Letzte Bearbeitung:
08.06.2016
Speichern
Abbrechen
OK

APIS


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Speichern
Abbrechen
QGIS 2.16.3 - APIS
Projekt
Bearbeiten
Ansicht
Layer
Einstellungen
Layerfenster

APIS



SNAPLAB



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research group



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research group



photography



image-based 3D modelling



SNAPLAB

monthly gathering



SNAPLAB

- monthly gathering
- equipment pool

snaplab
RESEARCH GROUP

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- monthly gathering
- equipment pool



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- monthly gathering
- equipment pool



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- monthly gathering
- equipment pool





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- monthly gathering
- equipment pool











SNAPLAB

- monthly gathering
- equipment pool
- knowledge hub

snaplab
RESEARCH GROUP

VENIA ARCHAEOLOGICAL SCIENCES

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habilitation

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habilitation



methodologically specialised

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habilitation

methodologically specialised

new teaching possibilities

Digital Archaeology at the UWien

01/04/2026 | CAA '26

Geert Verhoeven

universität wien